THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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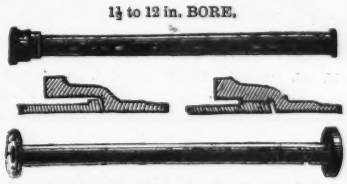

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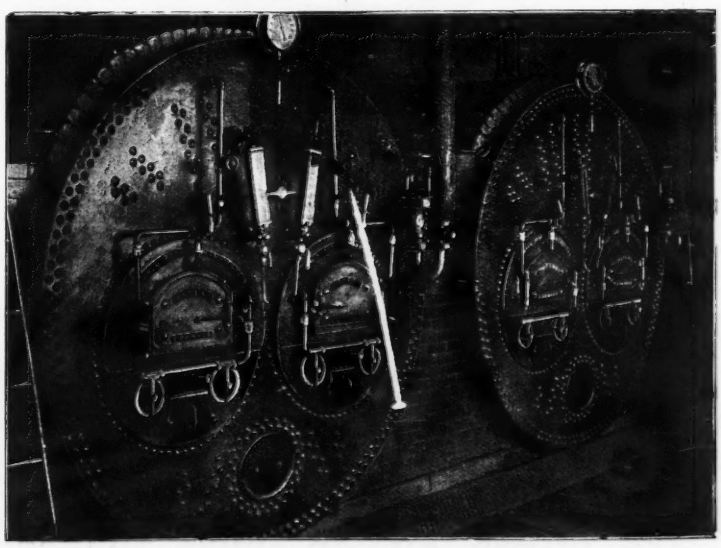

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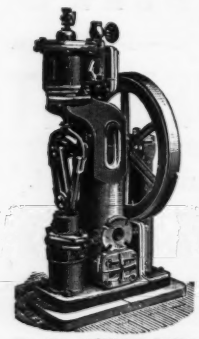

Fig. 705. "SINGLE RAM" STEAM-PUMP.

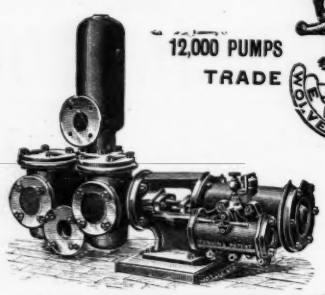

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

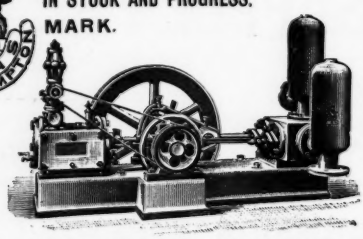

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

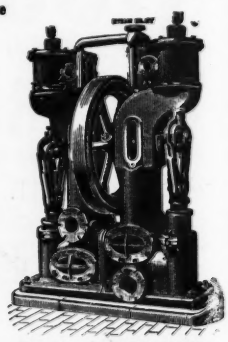

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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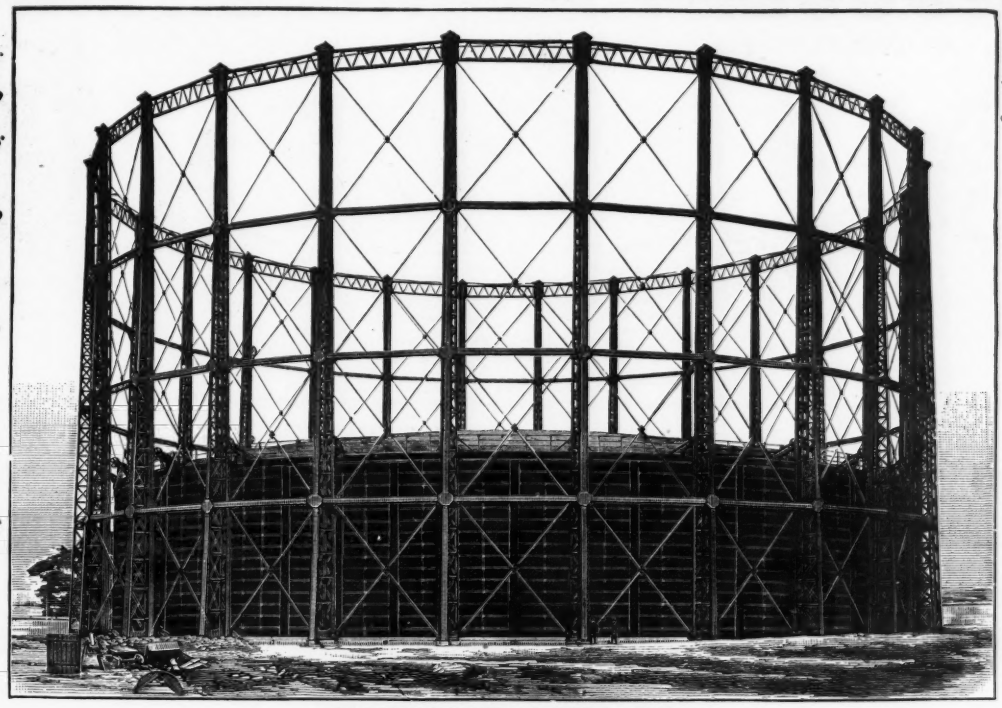

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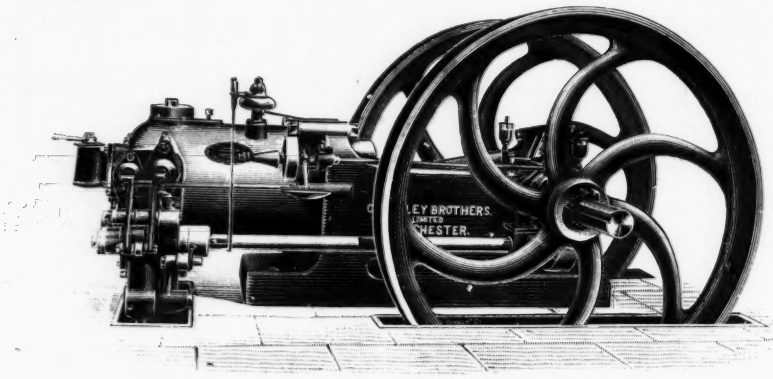

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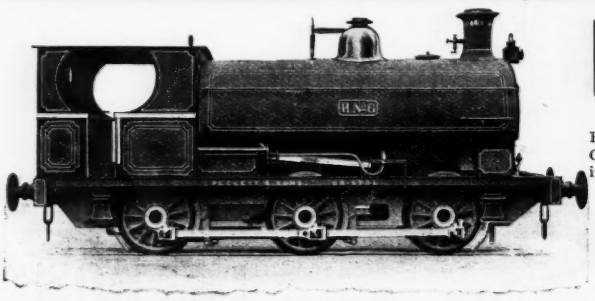

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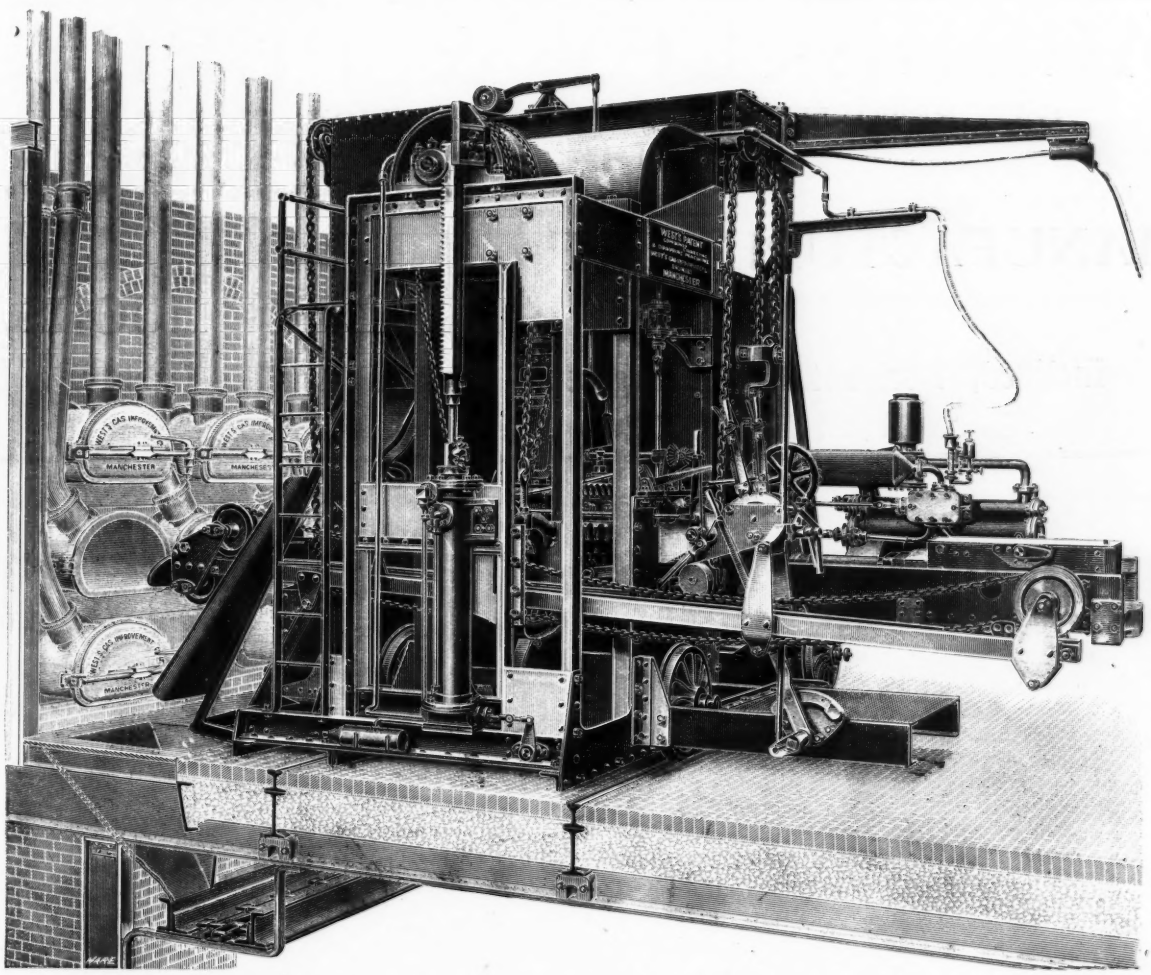

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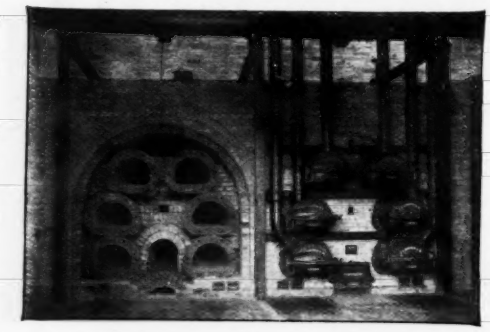

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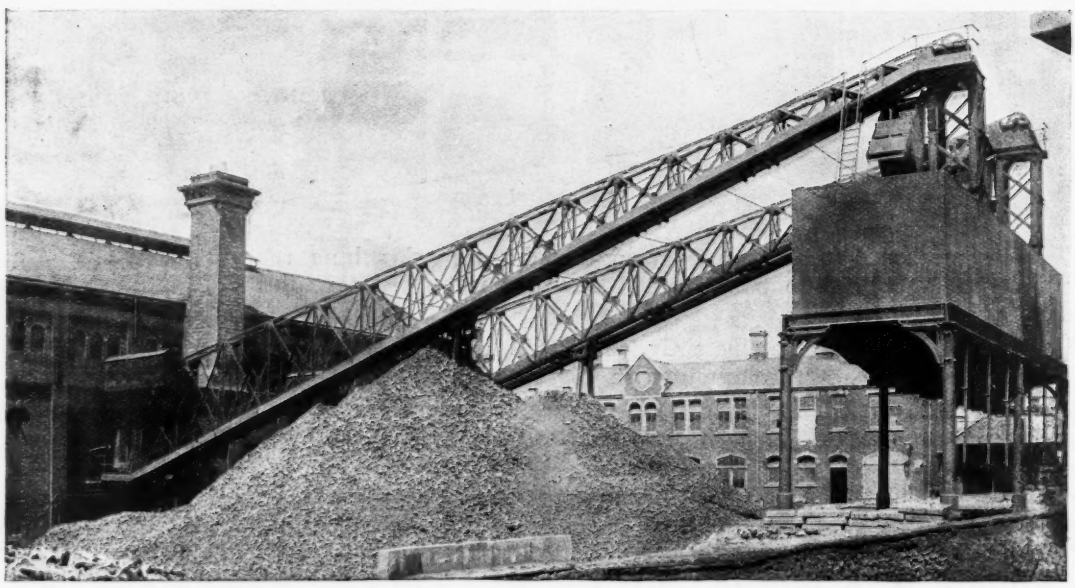

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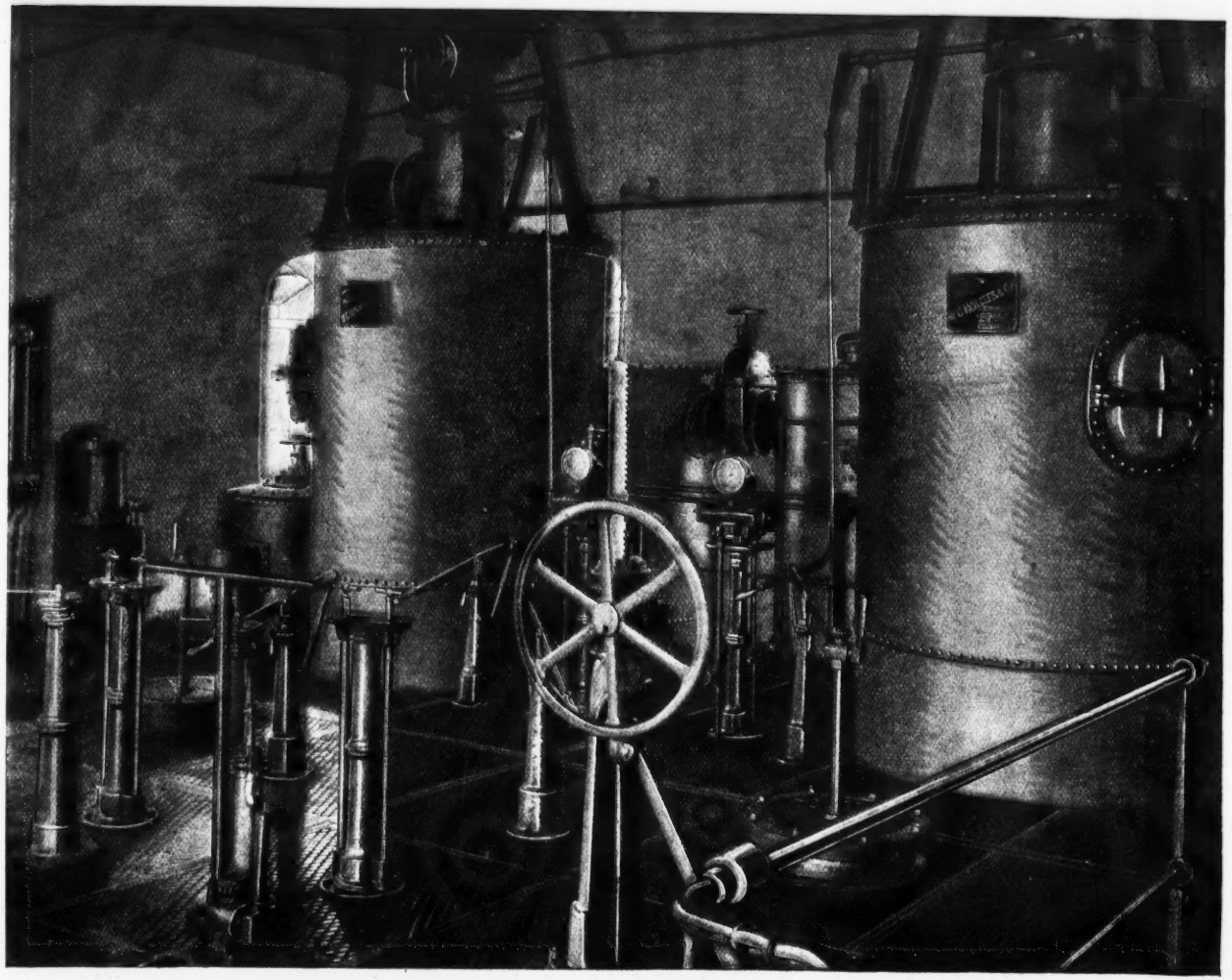

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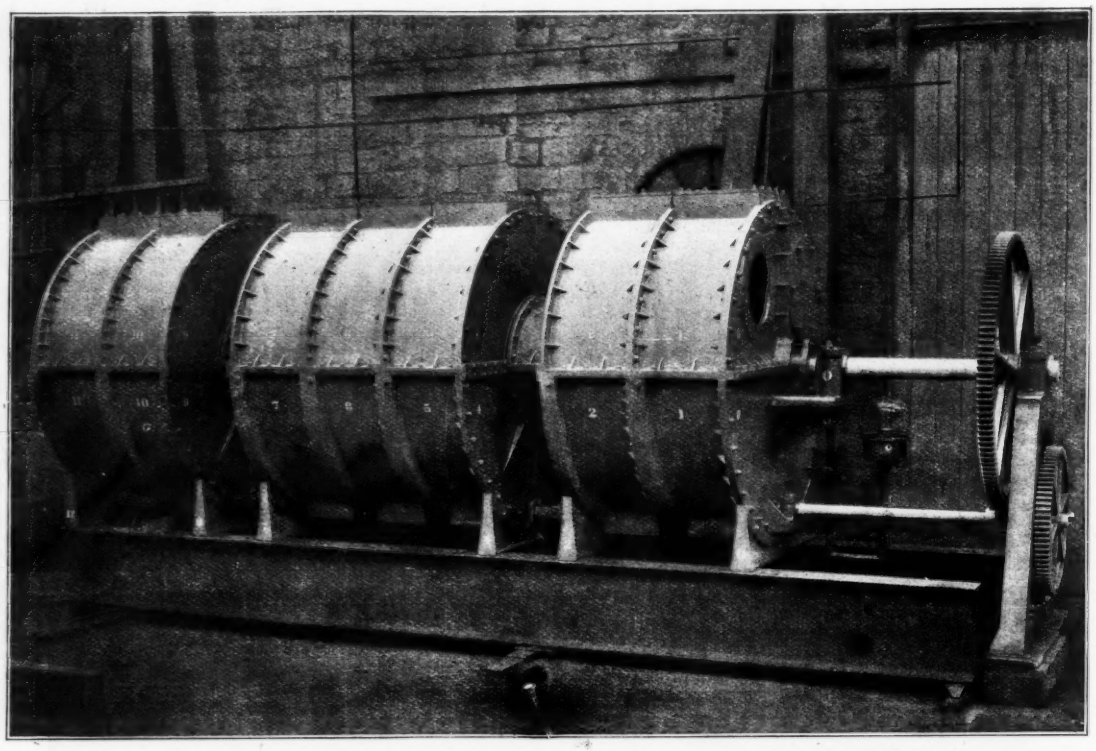

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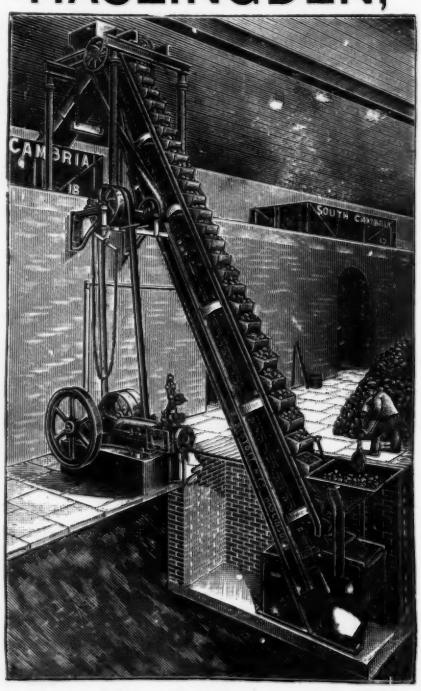

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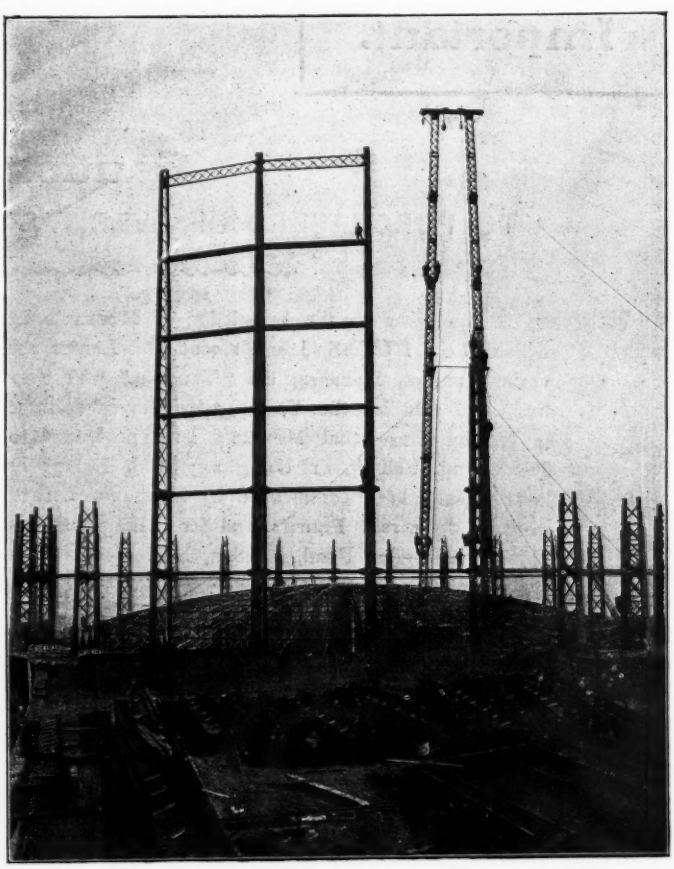

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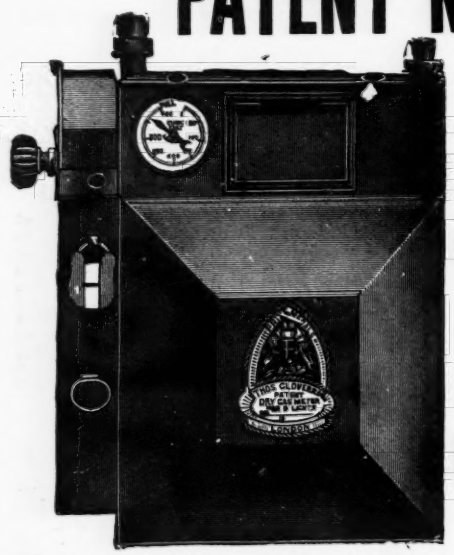

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EDITORIAL NOTES.

The Need for Enterprise in the Sale of Gas.

It is not only in regard to the sale of electric power that those who have the administration of gas undertakings upon their shoulders have something to watch, if not to learn from, in the proceedings of their commercial rivals the suppliers of electricity. As is doubtless natural on the part of those who have their way to make, in contradistinction to those who have merely succeeded to an old-established business, our friends the electricians are far more acute than gas officials in hunting up fresh business, and in adapting their commercial methods to such business as they can find open to them. A suburban resident remarked the other day, that he had no sooner moved into a new house than a very courteous and intelligent representative of the local electricity supply undertaking waited upon him, to inquire if they could have the pleasure of inscribing his name upon their books. It was the same when he took a fresh office in the City. Of course, he had to send off to the suburban gas company to notify his desire for gas, when certain forms had to be gone through. As to the office, it was not till after he had agreed to use the electric light (which was already installed) that he observed the existence of a gas-pipe in the building. There was no connection for a gas-fire, which was the very thing he needed. Instead, there was the usual sixpenny coal-scuttle arrangement with the house steward. In the circumstances, is it any wonder that the gas consumption in certain localities is inelastic?

The modern change of fashion in regard to the housekeeping of the middle-class town population in England, and especially in and about the Metropolis, has often been commented upon in these columns from the point of view of the gas industry; but little appears to have come of it. The significant word in this connection is "flats;" and the point is, that the electricians are awake to what the word means for their interest, if gas people are not. An illustration of this is very conveniently furnished by a communicated article in the current issue of the "Electrical Review" on the subject of prepayment meters—electrical, of course, in this case. This is, briefly, the writer's argument: Everywhere, spacious mansions and old-fashioned "eligible "residences," such as pleased our fathers, and as many of us still love in the abstract, no longer command the same attention from possible residents that they did formerly. We may deplore their disappearance to make room for the hard-featured examples of ingenious modern planning, "with all the latest improvements;" but the fact cannot be denied, that domiciles of the new type are ever on the increase and are in good demand. The reason for this is, in the main, a twofold one. People are no longer such "stay-at-homes" as their forbears. They travel more frequently, and remain away longer in the aggregate every year. This consideration leads to preference for a place of permanent residence that can be shut up, and left for long or short periods without any feeling of anxiety for the security of its contents. Allied to this desire is the effect of the great domestic servant difficulty. Not to go further into these matters, the broad result is that many residential areas are now rebuilt as a matter of course in flats, some quite small, the inmates of which can hardly ever say when they will be within. This condition of affairs has its inconvenience for those who have to collect the small household accounts. The electricians find it so in their experience. The money is only to be obtained by calling during certain hours, which may vary so much with different tenements, that the cost of collection seriously diminishes the profits on a few lights. These small accounts, again, are often "dodged" with persistency and success; so that a meter charge takes a good deal of unnecessary time and trouble to get in.

This reflection does not discourage the electrician. Far from it. He perceives that if he is to do such business as there is to be done in this particular field, which is large in the aggregate, it is necessary to have something like the gas companies' prepayment meter. In emitting this wish, he unintentionally pays a high compliment to a means of popularizing gas to which some gas officials have not yet been able to reconcile themselves. There is no such instrument available for electricity. Hear the conditions to be satisfied: "An instrument working reliably at all loads; obvia- "ting all chance of fraud on the part of the consumer or the "collector; and of low first cost." A fortune is promised to the lucky inventor of such an instrument. This is a very familiar form of words. No such reward has been reaped by the inventors or manufacturers of the prepayment gas-meters which actually do meet the requirements here indicated; and, as already remarked, they are not universally appreciated by all gas officials. The source of the disaffection in the latter case is perhaps the absence of sufficient interest in the new and troublesome branch of business, on the part of officers who personally could willingly do without it. It is for this reason that we have always urged upon gas directors to recognize the need for fostering this modern development in a suitable manner.

In a sense, the attitude of old gas directors and officials who are, first and foremost, excellent routineers, to the new requirements of their business (where these exist) is like that of the railway companies towards the new electric tramway traffic that is in so many places cutting away their profit. The passenger train which runs infrequently from not too conveniently situated stations, is competed with by a tramway service which does not require the passenger to wait two minutes. Certainly, many times during the day such tramcars carry only one or two passengers, and these journeys cannot possibly pay. The example curiously reminds one of those prepayment gas-meter supplies at which the gas manager occasionally grumbles as not being worth the cost and trouble they bring. But the right point of view from which this matter of the occasional run for nothing, or possibly at a loss, whether of tramcar or of meter, should be regarded, is that of the idle capital investment and working expenditure. The true question is this: Can running in this way take up some of the enormous "slack" of the idle period? In the case of the railway, this phenomenon is frequently visible to the least acute observer. There is the permanent way, there is the station, and there are the officials, the workpeople, and a shunted train or two, and perhaps a standing locomotive gently steaming into the ambient air. That locomotive costs its owners £1000 a year; and all the rest of the idle plant in connection with it is "eating its head off" when not working to the full limit of its capacity.

Is it arguable that electricians, being fresher at the job, are more solicitous about the "slack" than the railway and gas people, who have always been accustomed to its existence? Dr. N. G. Pierson, in his great book on "Economics," just published in English, remarks of the class of "under- "takers" who are shopkeepers, that they have usually, before setting up shop themselves, passed many years in an environment where they are subject to the ideas of persons who have long been engaged in the same kind of business. "These ideas sometimes embody the results of careful "observation; but they are frequently tainted with petti- "ness and ignorance. It is not at all unlikely that "those who follow them blindly sometimes find themselves "on the wrong track. So long as there is nothing to compel "a man to revise his ideas, he is in danger of neglecting "to do so; and shopkeepers do not, as a rule, belong to the "class which is least subject to the influence of precedent." Again, in discussing the subject of "monopoly prices," the same keen-sighted observer notes that "we cannot be sure "that the monopolist will always perceive wherein his true "interests lie; for the force of habit has to be reckoned "with, and must not be under-estimated. How long was it, "for example, before the directors of English railway com- "panies could bring themselves to see that the third-class "passenger traffic was capable of yielding profit? Our "view of the world of business would be quite wrong if we

"imagined that everyone in it had a keen perception of "what would bring him material advantage." It is unnecessary to point the moral of such weighty reflections. It either lies on the surface of the kinds of business to which they are applicable, or it will never be discovered by those who are afflicted with economic blindness.

Topics in Parliament.

THE announcement that the Bethesda labour troubles are to form the ground of a formal attack upon the Government the first thing after the reassembling of the House of Commons, is of interest as indicating how far the Labour wing of the official Opposition has succeeded in influencing the councils of the Party. It is a regular vote of censure that is to be moved, and consequently the Government are in duty bound to give a day for it. But the fact of such a vote having such a basis is a significant illustration of the nature of the change that has come over English party politics since the days of Cobden and Bright. For the offence of Lord Penrhyn is merely that, being an owner of property and an employer of labour, he chooses to keep the management of his possessions and the control of his workpeople in his own hands, instead of giving up everything to a sort of Trade Union which never included in its membership the whole of the workpeople. It is difficult to perceive what business the National Government has in any such matter. In the years of Cobden and Bright, it was understood that even the Factory Acts were objectionable to the party of Free Trade, on account of their interference with the liberty of the individual manufacturer to carry on his business in the best way he could. Nowadays, it seems that everybody is regarded (in some quarters) as free to do as he pleases with a man's business except himself.

A more generally interesting parliamentary question is that of how much the Chancellor of the Exchequer will be able to take off the income-tax. The British public are more than a little weary of the selfishness and arrogance of the professional Labour politicians, who are always trying, among other things, to show that the export duty on coal and the import duty on corn are particularly obnoxious to the British workman. What everybody is really more concerned about is, whether the existing war tax of 1s. 3d. in the pound on all taxable incomes is likely to be reduced to 1s., and how long it will stand at this figure. The claims of the income-tax payers to the first consideration of the Treasury have been admitted; and there is no question of what will happen if the threepenny reduction is not made. One of the aspects of this tax which is not often disclosed is that when it is abnormally high it acts as a check upon trading enterprise. There are thousands of people in the kingdom at the present time who are suffering, although they cannot tell how, from the war expenditure and the disappearance of the productive labour of those who were withdrawn from the forces of industry to swell those of destruction. Many traders, it is true, did not suffer from these causes at all, but rather profited by them. This is always the case in time of war. Some benefit by the enforced circulation of money and the enhanced demand for certain kinds of activity. But—and here is the point—there is in every old, settled community a large proportion of quiet people who neither fight nor trade; and it is the resources of this class that lose most from war taxes. They have not so much money to spend or to spare for investment as usual; and this makes many kinds of trade bad. An excessive income-tax strikes at the root of national prosperity in a variety of ways.

The Return and Retort of Mr. Glasgow.

IT is with the utmost pleasure that we find Mr. Glasgow has, on our invitation, reviewed his former resolve, and is continuing his single-handed combat with those who have embraced—for good and all, or until they have proved for themselves, or are incontrovertibly shown, the error of their ways—various systems of utilizing blue water gas other than in the manner that Mr. Glasgow holds is the only true one. It is also gratifying to see that he has in this further communication accepted the advice to eschew personalities, and has, except so far as the "JOURNAL" is concerned, settled down to the grave discussion of material points. Let us not be mistaken. We have no liking for discussions that are altogether inermous. They are apt to soon cloy, and become miserably tedious. But in technical debate, reflections on the conduct of persons are unnecessary; and in the first part of his present communication, Mr. Glasgow has shown once more his faculty for discussing interestingly without having recourse to such undesirable methods.

The greater portion of this fresh contribution consists of a criticism, and in certain particulars essential amendment, of the computations from Mr. Sidney Stephenson and Mr. J. H. Brown, published on March 24; and, remaining in the position adopted at the commencement of this present controversy, we leave them to settle their differences without intrusion on our part. It is to be inferred from Mr. Glasgow's polite reference to Mr. Brown's invitation not only to "witness," but to take part in, his prospective tests, that it is not likely to be accepted. This is a pity, seeing that the idea is not merely to test the veracity of a number of figures in question between two men, but to have a demonstration, under specially advantageous conditions, of the relative value of two processes, in both of which the whole industry are interested. And who better than the champion in this country of the Lowe carburetted water-gas plant could represent its interests in such an investigation? Then as to Cleethorpes, we have no doubt that Mr. Brockway will supply (as nearly as his short experience with his combined plant will enable him to) the additional information mentioned by Mr. Glasgow. But the latter gentleman will permit us to point out that, in his allusion to the Cleethorpes figures, he has perverted our footnote (it can not have been deliberately) by the omission of the expression "stand-by." The words in the footnote were: "The "stand-by charges [for the reason stated] are unduly high;" and not "these costs are unduly high." The omission gives to the sentence a rendering not intended. Bearing on the same point, Mr. Glasgow, in his subsequent references to the fuel consumption, appears to have neglected consideration (unless his unknown allowance "for inequalities in com-"parison" covers it) of the fact that in the Cleethorpes plant, the fuel consumption is "unduly high" owing to the comparatively small demand made upon its actual productive capability.

When Mr. Glasgow enters into controversy, he is not satisfied nnless he has a good "run" and "blow" for the trouble he takes. He has both again in this third article. Having avoided personalities, he this time indulges in the "luxury of a tilt at the editorial windmill," the use of which phrase by him brings to mind the hero of Cervantes' famous romance. He has apparently found great delectation in getting together a number of epithets to shower upon us. He is heartily welcome to the exercise, if it gives him amusement. He describes the Ilford article as "fulsome." It is something to be thankful for that the Knight-errant who confesses to tilting at windmills is not the sole judge. The Ilford article appears to us to be nothing more than a plain statement of what was seen and found on a visit to the gas-works there. It is quite conceivable that Mr. Glasgow would regard our denunciation of his reflections in a technical journal upon the conduct of divers people as "absurd." Again he is not the best judge; and we do not by any means stand alone in the unprejudiced and independently formed opinion as to their injudiciousness.

It is unnecessary to deal with Mr. Glasgow's flow of captious invective, except in a general way. If we were to take particular notice of, and succumb to, such criticism as the part which refers to the present controversy, we might just as well lay down the pen at once, and cease what is believed to be the useful duty of recording all the available information on new installations of plant and working; for it is in an account of one of these that the origin of the present discussion is found. In all the recent descriptive work that has appeared in these columns in connection with water-gas installations, we have abstained from the expression of any preferential view, while giving an honest account of all experience gained. For Mr. Glasgow's information, as he has apparently overlooked them, we may quote two or three pertinent sentences from the Cleethorpes article—

> There is no doubt that the combination gives him [Mr. Brockway] the greatest possible range in manipulating the plant to meet the circumstances of the times in respect of both market values and gas demand. But, speaking generally, in all but one particular, the same range can be accomplished by the ordinary Lowe type of plant with a bye-pass arrangement; and so it is with such a plant that Cleethorpes will have to vie for supremacy. With increscent experience and the publication of the results, the proof of superiority of one or the other, or an equality between them, will be established.

However, to the making of plain statemen's as to experi-

ences and to the citing of figures from works' records, Mr. Glasgow applies such descriptions as "writing approvingly," and "advancing incredible estimates," and he characterizes the data as "*your* figures." If he thinks that this kind of thing will tell in his endeavour to belittle, in the eyes of readers, the work of the "JOURNAL" in this regard, then he is making a further onslaught on their intelligence, in which he takes pains, in his present article, to express his every confidence. That confidence has not been particularly prominent in his recent writings. Mr. Glasgow's last paragraph but one should be read in conjunction with his original statement, in which he remarks: "I have no quarrel with "the details of cost of blue water gas as quoted in the "'JOURNAL' article of Dec. 30"—for the reason he proceeds to offer. A little later he reiterates: "I have no fault to "find with the figure of partial cost given by Mr. Brown, as "anyone possessing common knowledge of the subject can "readily estimate the additional costs necessary to cover the "cost in the holder." Yet the major part of Mr. Glasgow's subsequent and lengthy writings stand as a denial to his belief in the possession of "a common knowledge of the "subject" in the gas industry. He started the present controversy with the profession that he had no fault to find with the details given to, and published by, us; and now he ends the present tirade against the "JOURNAL" (which must be taken as his retaliation for the mild protest made against the personal tone of his former articles) in a manner altogether inconsistent with that profession. His own mistaken method of dealing with the subject in hand in the first and second articles will not be hidden by a gossamer covering of this kind.

In the course of his "tilt," Mr. Glasgow also endeavours, by a little clever manœuvring, to obscure the harshness of the terms which he employed in his previous reference to users of benzol. In the present controversy, mixtures of blue water gas and coal gas are being dealt with, and not common coal gas; and the information from working in this country as to the benzol-carrying power of such mixtures is yet too slight for the formation of any conclusive opinion. But Mr. Brown in his working at Ilford—using only a small quantity of benzol—assured us that he had experienced no trouble in this respect. Regarding the point as to calorific power, while no one disputes there is a loss, its measure has yet to be satisfactorily settled. We may refer Mr. Glasgow for proof to the evidence of Mr. Corbet Woodall, Mr. E. H. Stevenson, and other professional witnesses who appeared in the recent parliamentary inquiry into the Plymouth and Stonehouse Gas Company's Bill.

Importance of a Good Pressure in Gas Supply.

IT is probable that if the subject of the pressure at which gas is now being supplied in thriving and growing communities were raised at a gas managers' meeting, a good deal of surprise would be created by the tenour of most of the statements on this head. There are many distributing networks where the rule of reducing the pressure with an idea of effecting economy, except perhaps in the small hours of the morning, has long since been discarded. A standard pressure on the consumers' fittings of anything from 3 to 5 inches of water represents a vast difference from the old style of practice; but it is found to pay. The remarkable thing in this connection is that the consumers do not complain. Nine complaints out of ten, or more, are on the score of not being able to get enough gas; and a modern works manager looks upon a complaint of this kind as a reflection upon his business capacity. Such grumblings as those that lately made themselves heard in certain provincial places, of systematic overcharging of the consumers, are very archaic. When there is any meaning in them at all, they are no more than the temporary inflammation due to the restoration of a proper flow of gas to a system that had been improperly deprived of its due supply. The working rule now is to let the consumers have all the gas they want and will take. Any practicable rise of pressure on the outside of the consumers' meters will not hurt them. With a distributing system in proper condition, the proportion of unaccounted-for gas will not bear any relation to the distributing pressure. There is no reason at all why it should. Any system of mains and services can be made perfectly tight under a gas pressure of 50 inches of water; and why there should be any hesitancy in keeping the pressure up to 4 or 5 inches is a mystery. If economies are to be sought, it need not be in this respect. One consumer who does not get enough gas is a greater loss to the concern than any leaky main should be permitted to be.

The old-fashioned idea of keeping down day pressure to some arbitrary limit, or dodging the pressure about to allow of work being done upon the mains in the daytime, are chargeable with the loss of many customers to gas undertakings affected by these practices. It is even questionable if every gas manager realizes what good pressure, always available, means to the consumer. The fear that it may make the consumers' meters go round too fast, and so cause trouble in this way, is not for the gas manager to trouble his mind about. Let him do his part, and the consumer will do the rest. Indeed, the time has come when every expedient should be made use of to get gas to the consumer in the greatest plenty. Incandescent burners like a good pressure, and they will not do their best without it. Besides, these burners really are very economical of gas; and unless the pressure is kept up, they will burn too little gas either to please the consumer or to satisfy the supplier. The same remark applies to gas cooking-stoves. A thoroughly good pressure, always available, makes all the difference to the consumer and to the company. It is far easier to turn away the wrath that a rather heavy gas bill may excite, than to have the customer grumbling that he can get neither good light nor sufficient heat. There is no "bad gas" where the pressure is good.

The employment of "boosters" to help the discharge of light gasholders, or to keep the mains at a distance charged at an adequate pressure, is growing. It is so cheap and handy a means of filling a commonly felt want, that soon few gas undertakings will be without them. Up to a point, they are all that can be desired; and the point is a good distance ahead of most current experience. When it comes to keeping up a district pressure of 4 or 5 inches by means of gasholders throwing no more than 2½ inches, something, of course, has to be done; and the "booster" will do it. Put up a gas-engine, or a steam-turbine or a fan—no one of them at all an expensive or troublesome outfit—and the thing is done. Here we would take the opportunity for renewing our complaint that the out-and-out partisans of distributing gas under very high pressure do not tell us what they can do in this way. It has been explained over and over again that what is wanted is proof of the increase of delivery so as to justify the increased driving pressure; but this has never been supplied. What one is in the habit of thinking, both from precept and from ordinary experience, is that the delivery is simply as the square root of the pressure. According to the high-pressure men, they must do a great deal better than this, or their game would not be worth playing. It is not a little remarkable that any uncertainty whatever can still prevail upon this head. Of course, if a small pressure-main is opened into a small district holder, it will put gas into it for a time at a very rapid rate. But this is not the point. The question of the true efficiency of high-pressure gas delivery has been vainly asked so long that its repetition is wearisome.

To the Discredit of Incandescent Gas Lighting.

It is high time that something was done by gas suppliers to advise, without bias, gas consumers as to which are the reliable makers of mantles; and not only that but to assist the makers, whenever possible, to run to earth vendors of spurious goods. The pouring into the market of a large and continual stream of inferior mantles is an inevitable consequence of the infinite success which has followed incandescent gas lighting. But gas consumers in most places are left without guidance and without warning in this matter, with the result that wherever one travels now among consumers the complaint is heard of the crazy condition into which new mantles quickly fall, and of their perfidiousness in the matter of light-giving power. It is not in the interests either of incandescent gas lighting or gas suppliers that this kind of thing should continue. Said a private gas and electric light consumer to the writer a few days since: "Can you tell me of a good mantle? Those I have got burst immediately they are burnt off; and if I cannot get a decent one, then I think that I shall go over to electricity entirely." On inquiring the name of the mantle he was using, he produced a sample, packed in a white cylindrical box—and nameless.

No one had been sufficiently interested to inform this consumer as to which were reliable makes of mantles; and so incandescent gas lighting was fast becoming dishonoured in his eyes. We have tried some of these mantles; and their effective life is limited to a less number of hours than should be their duration in weeks or even months. One or two makes, too, which are glorified by attractive names, and which have lately been under test, are found to have the unhappy habit of dropping away from the head very quickly after being put into use. They are a disgrace to the makers; and the makers of such rubbish are a disgrace to a big and thriving industry. Whatever can be done to prevent the beguiling of gas consumers in this matter should be done.

The Spurious Mantle.

Then there is the traffic in spurious mantles which is now going on, and which it is more difficult to deal with. It is to be feared that this system of imposition and fraud has grown to larger dimensions than will ever be traced, though a good trial to trace it is being made. It is one of the basest forms of craft and imposture to palm off a bastard production on the unsuspecting user, under an honest and recognized trade name; and we are glad indeed that both the Welsbach and the Guaranty Companies are doing their best to suppress the extensive trade that is going on in this way. In three consecutive numbers of the "JOURNAL," references have appeared to legal proceedings in connection with this fraudulent class of business. In the Birmingham case reported on March 31, a heavy—not too heavy, though we believe it is the maximum—fine was imposed; and in the Liverpool case reported this week, the defendant had to pay a substantial amount. The method adopted by the plaintiffs in these cases is swift in bringing this class of traffickers to justice; and it is hoped that the monetary punishment awarded in these instances will have a salutary effect in stopping the illicit business. If it does not, then it will have to come to imprisonment. If any assistance in this matter can be given by gas authorities to the makers of respectable and genuine mantles, we ask in the interest of all that it be given.

Reductions in Price and Illuminating Power.

In making reductions in the price of gas and illuminating power, great things must not be expected to accrue immediately in the way of an increment in consumption. That is one of the lessons of the past year's experience of the San Paulo Gas Company. Away in Brazil, this English directed Company have brought their methods up to a line with the most advanced undertakings in this country. Under the terms of their new contract, they are, as soon as they have completed the conversion of the public lamps to the incandescent system, going to reduce the illuminating power of the gas from 17 to 14 candles, and the consideration to the consumers and public authorities is a lowering of the price charged from 170 reis to 140 reis per cubic metre. The conversion of the public lamps is not finished; so that the Company are not yet realizing the benefit which will accrue to them in the way of saving on the enriching material that they now have to employ. But, this notwithstanding, according to their covenant, they had to make the concession of 30 reis per cubic metre to the private consumers as from March 1, 1902. The result was only an increase in consumption of 2 per cent.; while the private consumers gained an advantage by the reduction in price equal to £8064. The net profit, however, was only £1799 less. This, in the circumstances, small increase in consumption is attributed entirely to the fact that the consumers did not at first appreciate to the full what the reduction meant to them. But they are gradually being educated to a better understanding of the position; and the result is seen in the returns for last December, which revealed a 28 per cent. increase in the consumption compared with the corresponding month of the preceding year. This is highly gratifying. But there is another fact, upon which the Chairman (Mr. D. M. Fox) omitted to lay stress. It is that the fast and widespread adoption of incandescent gas burners must have had a little effect in stifling temporarily the increase in consumption for lighting purposes; while the new efforts of the Directors and the Manager to secure business in other directions have not, while the results certainly are good, yet had a countervailing effect. But their endeavours are now making a development which is having a decidedly gratifying impression on the returns; and when the Company gain the full benefit which the elimination from their working of the need of using enriching cannel will have, the shareholders, we venture to predict, will have every reason for satisfaction with the intelligence which has been displayed in the management of their affairs, in the presence of the great activity of the electric lighting interest in San Paulo. In connection with a topic of current discussion, it may be noted that for the past nine years the Directors have had on this side the advantage of the counsel of Mr. A. F. Phillips as Consulting Engineer. They so recognize the value of having a trained gas man taking part in their deliberations that, on their own recommendation, Mr. Phillips has been elected to a seat on the Board, in order that he may have even a more intimate association with the administration of the Company. The proceedings at the annual meeting, so far as they refer to the question of the reductions in price and illuminating power, will be found extremely interesting.

The Waverley Association Meeting.

Circumstances have led to the Waverley Association of Gas Managers obtaining, chronologically, the first place among this year's meetings of Scotch Gas Managers. The fare that was served up at the meeting at Penicuik last Thursday was such that the members of the Association would be justified in looking forward to holding the leading position also on the merits during the season. Readers of the proceedings will not fail to notice that nearly all that was spoken came from the lips of gentlemen who are not members of the Association. Of course, this was due, in the first place, to the dislocation of the business of the meeting which resulted from the absence of the President, on account of which the members were left without the guidance of their thoughts into reflective channels, which they had a right to expect. It was certainly matter for great regret that the President should not have discovered earlier that he was unable to be present; and the gentlemen who, in his absence, engineered the meeting, deserve the thanks of all the members, which, though unexpressed, they doubtless have. But it cannot fail to be noted, further, that the Waverley Association are, year by year, finding their meetings more frequented by professional men who are not members, but who are present by invitation. This gives a much wider interest to the affairs of the Association than they would have if they were confined to matters which relate to gas business in the South-East of Scotland. This policy of making the best men in the profession their schoolmasters has been, if we are to judge by appearances, a profitable one for them; for it is the fact that they have scarcely a Past-President in their ranks. Four of the ex-Presidents, including Mr. L. Bell, who has just quitted office, have left for better employment—three of them as gas managers and the fourth as an engineer—which certainly, although it might be made an excuse for poverty among the remanent members, is not, but is rather the occasion of their opening their doors wider in order that they may share still further in the flowing tide which might otherwise rush past them. Certain it is that the meetings of the Waverley Association have been growing in brightness and in attractiveness; and as to usefulness, no more proof is needed than the state of the roll of Past-Presidents. Thursday's meeting dealt with the three subjects of stoking, enrichment, and purification—the very citadel of gas making—upon all of which subjects the reasoning was of such a nature that members of a practical turn of mind should be able to beneficially apply the information they received, while they hold themselves in readiness to "ask for more."

The Plaissetty Mantle.

The rumour which went the round of the financial press two or three weeks ago that the Welsbach Company had entered into some kind of working agreement with the Plaissetty Mantle Syndicate, Limited, is now confirmed by a circular-letter issued by the latter last week. It gives the information that a sole licence for the manufacture of Plaissetty mantles for sale in the United Kingdom has been granted to the Welsbach Company, and requests that all future communications concerning that mantle should now be addressed to them. What with the Plaissetty, the Knoefler, the Welsbach, and the cheap form of Sunlight mantles, the Welsbach Company evidently intend putting themselves into a position to meet any and every kind

of demand and form of competition. It is a notorious fact that they have been getting rid of their various branch manufactories during the past year, and are now entirely devoting their energies to the production of mantles, of which, with their new acquisition, they will have a choice variety.

Private Bill Procedure Reform.

Soon after the present parliamentary recess, the authorities of the House of Commons are going to have a conference on the arrangements for Private Bill procedure, in view of the several important recommendations made last session by the Select Committee who were appointed to inquire into the Standing Orders applying to private business. The report, it will be remembered, practically covered the whole subject of procedure. Some of the minor points embraced in it have already been provided for; but certain of the larger questions have been allowed to stand over during the absence of Mr. J. W. Lowther, the Chairman of Committees. These are now to be taken in hand. In their report, it will be within the recollection of readers, the Committee declined to offer any recommendation on the subject of Joint Committees of both Houses to deal with Private Bills, so as to have single instead of double inquiries as now; and the question of the appointment of a Committee constituted of members of both Chambers to consider this particular matter is among those which will be discussed immediately after the holidays. While the Select Committee refrained from an expression of opinion on this point of the single inquiry, it is pretty plain which way their sympathy and vote would have gone if one or other or both had been put to the test. The whole of their recommendations were directed to the easing of the expense of applications to Parliament by local bodies and private enterprises.

For and Against Single Inquiries.

Of course, there are arguments both for and against the single inquiry in connection with Private Bills. But it has many attractions for one experienced, and not pecuniarily interested, in Committee work; and unhesitatingly we should declare a preference for it from the cost and expeditory points of view. But there is a risk about it, which risk seems inseparable from, and often appears in, the verdicts of both Lords and Commons Committees under present conditions; and, without an improvement in these conditions, the risk would simply be perpetuated under the Joint Committee system. To gain for a single inquiry universal approval, steps would have to be taken to ensure that the Joint Committees had proper guidance and advice, ready means of reference to precedents on points of principle, and so on, to ensure that there was not that lamentable discrepancy in decisions on contested questions that is now so frequently witnessed. The power of appeal to the second Committee is often found to be very useful; and it is in its abuse that much unnecessary expense is incurred. Then, again, if verdicts can be obtained at lessened expense, opposition may become even more rife than it is to-day, but it could not be carried to such extremes as now. On the other hand, there are Bills nearly every session into which nobody of local authority or standing considers it his duty to examine; and so they go forward without receiving full and proper review. A judicious curtailing of the present cumbrous method of procedure may have a beneficial effect in this regard. However, it will be seen that there are arguments both in favour and against single Committee inquiries; and those put forward here do not by any means exhaust them. But, on the whole, with adequate safeguarding conditions, the change would, we are inclined to believe, have a balance of advantage.

High Rates

A useful commentary to the cheerful optimism displayed by Sir Albert Rollit in his recent speech at the meeting of the Association of Municipal Corporations is supplied by the annual report of the Estate and Finance Committee of the Dublin City Council, as well as by the perpetual borrowings of the London County Council. In Dublin, it is stated that, during the ten years ending at March last, the sum required for interest and repayment of loans had increased from £57,310 to £115,095, or including the added area to £130,328. This provision is further increased to £134,111 for the current year, or including the added area to £148,986. Besides this the city have another responsibility on capital account in the shape of the Richmond District Lunatic Asylum, where a corresponding expenditure has gone on from the sum of £935 provided in 1892 to £27,500 provided for in 1903-4. For the relief of this enormous expenditure is available the net working profit on so much of the capital outlay as is reproductive; and this profit the Committee put at about £30,000 per annum. The total provision, including the Richmond Asylum loan, comes therefore to £176,486 per annum; and if this is credited with the above-mentioned profit, the balance to be raised to meet obligations on capital account comes to £146,486. To produce this sum, it is necessary to levy a rate of no less than 3s. 11d. in the pound, before a single farthing is provided for the ordinary upkeep of the city. The Committee point out that the income from their reproductive works—especially the electric lighting plant—will be more developed in two or three years' time; and as a means towards this end, they propose to increase the cost of public lighting in the city by over £6000 a year, by fixing up 419 additional arc lamps and removing 1200 gas-lamps. It is admitted that "the cost of electrically lighting the area within which the arc lamps are to be erected is a little over twice the cost of lighting the similar area heretofore with gas." Here is an interesting sidelight on the working of "reproductive undertakings of municipalities." It should be easy to make a 4 per cent., or even a 40 per cent., "profit" in this way; but we should like to know how the ratepayers benefit. Is it not somewhat akin to a man buying a loaf at 4d., selling it to himself at 6d., and then saying he has made 2d. profit? What would be said of the business capacity of a person who tried to earn a living by making a profit out of himself? It is only necessary to add that the Finance Committee at Dublin have recommended an increase of 1s. 1d. in the pound, making the rates for the ensuing year 11s. 2d. on the north side of the city, and 10s. 4d. on the south.

And a Suggestion.

Turning from the Irish Capital to our own County Council, it is to be noted that they have just issued a new 3 per cent. loan of £5,000,000, bringing the total amount borrowed within fourteen years well over £30,000,000. Needless to say, the rates also have been rising, and no doubt will still further rise. The present aims and ambitions of the London County Council, whatever may be their other good or bad points, are certainly not conducive to economy—that seems to be regarded as of quite secondary importance. But until a check of some sort or another can be put upon the spending proclivities of the municipalites, the ratepayers must endeavour to bear their increasing burdens. Should they, however, meantime find themselves unable any longer to support the weight which is already in many cases well nigh unbearable, the action of some of their fellow-sufferers in Finland may suggest to them a way out of their difficulties. It is reported by the St. Petersburg correspondent of the "Daily Chronicle" that, according to the Finnish paper "Tyomies," in the neighbourhood of the town of Helsingfors there are at the present time people who are living in caves. Their excuse for so doing is that they find it impossible to pay the rates and taxes, which in Helsingfors are unusually heavy. We are able to sympathize with these Finnish cave-dwellers.

The programme of the annual meeting of the Iron and Steel Institute, which will be held in Westminster on the 7th and 8th prox., promises to be more than usually interesting. The Inaugural Address of Mr. Andrew Carnegie will deal with the great organizations of capital and labour in the world, particularly with reference to American industrial problems. Mr. Carnegie will present Sir James Kitson, M.P., with the Bessemer gold medal for his services to the iron and steel industries.

At a recent meeting of the American Chemical Society, Mr. Maximilian Toch delivered a lecture on the "Permanent Protection of Steel and Iron." He demonstrated by means of photographs and photo-micrographs that steel and iron are corroded in some cases slowly, and in others rapidly, even when embedded in masonry. The microscopic structure of several cements was shown, and he prophesied that, in the future, oil paint will in a great many instances be displaced by cement paints. Mr. Toch mentioned novel experiments he had made with cement preparations by changing the specific gravity of the cement, ridding it completely of iron, and diluting it in such a way that it could be used as a paint. It is made to set quickly, so that it not only adheres to the steel and iron, but it has the same coefficient of expansion. It is anticipated that Mr. Toch's method, on which he has worked for some years, will cause extensive changes in the preservative coating of steel structures.

ESSAYS AND REVIEWS.

A DEVELOPMENT OF THE "QUESTION-BOX."

THOSE of our readers who peruse the abstract reports of the proceedings of the American Associations of Gas Managers are aware that a by no means insignificant feature of the gatherings of these bodies is the practice of seeking information on points of manufacture and distribution by means of the "question-box." A member has possibly met with some little difficulty in the course of his duties, and he is desirous of having his colleagues' views on the matter. It may not be, and in all probability is not, of sufficient importance to be made the subject of a paper of the dimensions to which members of the Gas Managers' Associations in England and America are accustomed, though it might be brought forward in the shorter form adopted for many of the communications submitted to the Société Technique du Gaz en France. A simpler and more convenient method of eliciting opinions is however, the one above alluded to. The general rule has been for the member merely to put his question on a slip of paper and drop it into the box; when he might be pretty sure of getting an answer of some kind to his inquiry before the meeting closed. The institution is, in fact, an embodiment of the system of mutual help which is afforded by the little familiar conversations between members for which these professional gatherings afford such excellent opportunities. It is a very good idea, and the extent to which it can be developed has been shown by the Ohio Gaslight Association, whose nineteenth annual meeting was held at Cincinnati from the 18th to the 20th ult., under the presidency of Mr. C. W. Andrews, of Hamilton.* The Association have put the "question-box" on a much higher plane than it previously occupied In the course of the address delivered by Mr. Henry L. Doherty, in his capacity of President of the Association, at the meeting at Columbus last year, he referred to a radical change which had been made in the programme for the meeting, by taking important subjects for discussion instead of having set papers; and he suggested that this feature was capable of considerable development. This has been done by the formation of a "Question-Box Department," which is an elaboration of the original idea far beyond the comprehension of the proposer. It appears that for the recent meeting something like 600 questions were prepared, and no less than 458 of them were answered. These have been issued in a pamphlet which extends to 158 ordinary octavo pages. They are prefaced by a few remarks by Mr. Doherty (the Editor), setting forth the advantages of the new system, which will, he says, if carried to its logical conclusion, "make the annual conventions of the Association an exchange market for ideas and a clearing-house of knowledge."

Mr. Doherty begins by pointing out that the value of any Association of the character of the Ohio must be measured by the services it can render to its members, and that the latter will most keenly appreciate the information they most desire. How, he asks, is it possible for the Committee or the officers to determine beforehand what will be prized to the greatest extent by all the members? Some expression must, he says, be obtained from them individually; and this can best be done by the medium of the "question-box." As the benefits of co-operation increase faster than the arithmetical increase in the number of participants, the greatest good will result from the greatest degree of co-operation. Mr. Doherty acknowledges that within the limits of the membership of the Association it may not be possible to find the best solutions to the problems which confront the members; but in the efforts made to solve them some who are outside the limit will most certainly be benefited. This he considers should be sufficient justification for looking beyond the ranks of membership for co-operation and assistance; and he does not think this help will be sought in vain—the "fraternal ties between gas managers" being due to "more rational causes than Association membership."

Coming to the results of his efforts in connection with the recent meeting, Mr. Doherty confesses that the assistance rendered in the way of sending replies did not equal his expectations, though the number of questions asked far exceeded his calculations. In some cases it was found to be impossible, for various reasons, to supply the information sought. The time available was short, the plan was not well understood, and the co-operation of many gas engineers, who were fully able to furnish the desired information with but slight inconvenience to themselves, could not be secured. Mr. Doherty hopes this is not an indication of a tendency towards a less strict observance of professional ethics. He thinks it is not. He emphasizes this important point—that the future of the gas business, and as a consequence the very existence of Associations of those who are professionally engaged in it, depend upon "the willingness of gas managers to give freely of their stock of knowledge." He expresses the hope that the "question-box" idea will be tried another year, when the members of the gas fraternity will be again asked for assistance. He thinks that when these gentlemen see how earnest the Association are, and how unselfishly they use the information secured, their co-operation in this essentially beneficial scheme will not be sought in vain.

Proceeding to give some details as to the initiation of the new department of the Association, Mr. Doherty points out that many problems of primary importance are not generally understood, simply and solely because engineers and managers do not agree in their views. Recognizing this, he set about planning some remedial method, and came to the conclusion that the Association should establish a department for research and investigation work. He accordingly sent out a slip containing the following questions:—

1.—Each company is requested to describe the method of mapping mains, showing the symbols used to designate sizes of mains, drips, specials, &c. (The object of this is to evolve some standard method which can eventually be adopted by all companies.)

2.—What disposition do you make of your coke breeze?

3.—Each company is asked to make a list of all purposes for which gas is used in the town, and, if possible, to give the amount of gas used for each purpose. (The object of this inquiry is to open up generally new uses for gas where such use may now be confined to only one or a few towns.)

4.—What sizes of coke do you prepare for the market, and by what names do you designate these sizes? (The object of this inquiry is to recommend some standard sizes and provide standard nomenclature for their designation. It is also believed that the coke market can be advantageously cultivated if standard sizes of coke are prepared; thus enabling stove manufacturers to properly design their stoves for the standard sizes.)

5.—Let each company describe the method used for scurfing retorts, with data regarding frequency of scurfing and time required.

6.—What special form of furnace grates or stokers are used for burning breeze, and what is its fuel value in comparison with good steam coal?

7.—What paint do you paint your holders with, and why do you prefer it?

Very few replies were received to the first question; none of the companies whose managers are members of the Association apparently using the same system of mapping the mains. Mr. Doherty, however, thinks the conditions are so nearly alike that one plan might be advantageously adopted. Few replies also were received as to the disposal of breeze; but it was found to be pretty generally used as fuel. The third question elicited the interesting information that gas is used for about a hundred different purposes, a list of which Mr. Doherty gives. Question No. 4 brought out the fact that no uniformity now prevails in regard to the sizes of coke prepared for the market, and that no standard nomenclature has been evolved to designate these sizes, even when uniform. Questions Nos. 5 and 7 did not produce anything worth commenting upon; while the answers to No. 6 showed that in one case breeze is burnt with a natural draught and a fishbone grate, in another with a hollow grate-bar, and in a third with an under-feed stoker. No returns were made as to its value as a fuel. The Detroit Company utilize breeze in the water-gas plant, and apparently with greater advantage than would result from its use under the boilers.

It is impossible to deal here with the questions contained in the pamphlet. Suffice it to say that they embrace subjects in practically every department of gas manufacture and supply. There is an index to the questions and to those who have answered them; so that reference is greatly assisted. Mr. Doherty commends to the appreciation of the Association the courtesy of "those unselfish gas managers and engineers" who generously contributed to his work, and whose liberality made the department possible; and he acknowledges his own personal indebtedness to them. If the contribution to gas literature resulting from their combined efforts should find any value in the eyes of the gas profession generally, he hopes they will testify this by support in the future. "The expenses, work, and worry are," he says, "dedicated to the progress, co-operation, and advancement of the gas business, the gas fraternity, and gas engineering science."

* The somewhat similar proceedings at the New England Association are noticed in another column, p. 93, to-day.

A PROPOSED NEW SYSTEM OF BUILDING RETORT-HOUSES.

[SECOND ARTICLE.]

THE previous article on the above subject (*ante*, p. 24) closed with some remarks on the cleaning of surfaces of ironwork by the sand-blast. But, notwithstanding everything that can be done to preserve it, exposed iron in such structures as railway viaducts and retort-house roofs is essentially perishable. In the latter case, particularly, the renewal of all the lighter ironwork, such as the purlins, is only a too familiar operation of gas-works upkeep. This was not perhaps a ruinous affair in respect to the small and comparatively lightly-built retort-houses of the older pattern; but the day of these structures is past, and modern retort-houses are at once more costly to build and far more expensive to maintain. In many examples they are mostly steel; and those who observe how much of this material is built into them can but think uneasily of what its state is likely to be in about forty years. For there is no apparent reason why there should be anything temporary in the construction of one of the huge retort-houses of a first-class gas-works—not confining the classification to the very largest establishments. Even the managers of moderate-sized gas-works find it advantageous to concentrate their carbonizing plant, instead ot having it scattered

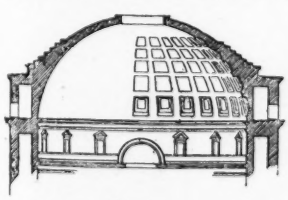
through two or more small, poky old buildings. Labour-saving arrangements are facilitated in this way, which is a quite legitimate consideration. What is at least questionable, however, is the fashion of the lavish employment of steel in the construction of these palaces of machinery. It is usual to balance capital cost against labour-saving devices, on the rough-and-ready basis that the wages saved should more than pay for the capital and upkeep. Even this rule, however, is not so simple to use in all things as it looks; but when it is a case of laying out capital upon perishable building materials, the problem requires careful statement if the solution is to be convincing.

The charge for antiquation is one that need not be taken into account in evaluating a modern retort-house on actuarial lines, because, as already observed, there is no reason why it should grow obsolete. The controversy as between inclined and horizontal retort-settings, and the various ways of supplementing coal with water gas, is beside the question of the building of the house which is to shelter these manufacturing appliances. Its leading dimensions, also, are fairly settled. In no single respect, therefore, is the present-day retort-house likely to be superseded; and this is all the better reason why it should be built in a permanent style. It might be a hard saying to lay it down as an axiom that no building of iron or steel can be permanent; but the point is at least debateable. Old iron is not as old masonry; its very name does not convey the impression of durability. In a word, iron depreciates with age, while masonry to some degree improves, and in the long run does not necessarily fail through its age. Obviously, the masonry must be of an appropriate description for its use; and this requirement may now-a-days, with care, be satisfied over a wider range of building purposes than formerly.

What a melancholy object is an iron roof that has been allowed to fall into disrepair! And it costs a good deal to prevent this. A thoroughly satisfactory way of attaching slates to an iron roof is yet to seek; and the slates themselves do not bear fastening on well in this connection. For all these and some other reasons which need not be set out, therefore, it is pertinent to inquire whether it may not be possible to break away, in the building of retort-houses, from the rigid rule of ironwork construction. Bricks and mortar are still cheaper than steel; and seeing that massiveness is a requirement of machinery-house design, this material, in conjunction with armoured concrete, may be destined to a revival of popularity with engineers.

It seems that, in order to make the change of style in retort-house building possible, a reform of the ideal for such constructions must come first. How is this to be brought about? Briefly, we suggest, by working upon a distaste for the conventional forms of architecture in iron, driving the designer back upon other and more pleasing styles. The alternative to the ridged roof is to be found in the dome, and its development, the vault. Now, though the rounded, elliptical, or waggon-headed form of roof is not unfamiliar in engineering, and roof-principals are very often so shaped to support straight roofing, the dome and the vault are extremely rare. The form has been neglected, probably undeservedly. The suggestion of this article is, that in domical and vaulted building construction, especially of what is known as the Byzantine character with flattened "saucer-shaped" domes, made in reinforced concrete, there may be found the possibility for both redeeming retort-houses from unnecessary ugliness, and reinstating them in durability.

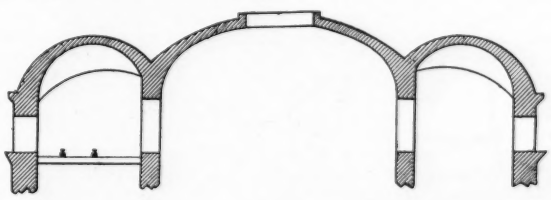
Let us, with this object in view, take a departure from the oldest and noblest of all the domes that have come down to us from the past—the Pantheon, "pride of Rome." The accompanying vertical section of this relic of antiquity is taken from a drawing by Professor Hamblin, of Columbia University, published with his permission in the "Engineering Record." It is expedient to ascertain what this example of domical construction can teach us. It has been well observed that the style is characteristically Roman. It enabled those who understood it to obtain the effect of spacious room and cover, without columns or piers. Greek buildings are only known to us as roofless ruins. The Egyptians could not span more than 20 feet wide in the clear. The Baths of Diocletian in Rome offer a strong contrast with this state of things, with an unencumbered floor space of 340 ft. by 87 ft., covered by a groined vault 90 feet high. The example now in question—the Pantheon—was built by the Emperor Hadrian between the years 117 and 138 A.D. It is circular in plan, 142 feet in diameter, covered by a dome 140 feet high in the centre, with a 28 feet opening at the summit. The dome rests upon a massive wall, and there is a "drum" encircling the exterior of the dome up to one-third of its height, which, with the tiers of vertical steps above it, provides for thickening over the haunches—a necessary concentration of weight to ensure stability in the absence of a chain curb, or some other support.



The internal decoration of the dome is done by panelling, as shown, which raises what is called the paradox of the Pantheon. This decoration is not necessary. The vaulting of the Baths of Diocletian, now the Church of S. Maria d' Angeli, is quite plain. The panelling in the case of the Pantheon naturally suggests a structural origin. It looks as though the architect had made the dome by a cluster of vertical ribs, converging to the centre, connected at intervals by a series of horizontal rings of diminishing size. In that case, it would have seemed a natural proceeding to make panels of the spaces thus marked out; but, as a matter of fact, while it is impossible now to say positively how the dome was built, it is at any rate clear that the panel decoration does not correspond with any structural principle. The dome was not built in that way at all. It is essentially a solid shell of brickwork, and it is believed that the panels were cut in afterwards. The manner in which the dome itself was made is a subject for speculation; but, unless the Roman builders acted for once in opposition to their ordinary custom, it was probably done by a series of relieving arches formed round the springing, supporting others—the inside face of all conforming to the shape of the dome. It is the distinguishing feature of the dome that it does not require a complete set of centring, as an arch does. If built up in rings from the haunches, it is self-supporting—within limits, of course. The Italian masons are very clever, even to this day, in building small domes with tiles in cement, coming-over as they go.

Not the least attraction of the dome, for the Romans, was the facility with which it could be realized in their own special material, concrete, which they used to fill in their massive piers and vaultings. A very light framed centring, for example, would suffice to carry an intrados of flat bricks or large tiles in strong cement. As this set, another tier, breaking joint, would be laid over the first, and allowed to set hard. Then the concrete could be gradually filled over the haunches, from both sides at once; and this could be thickened, and carried up towards the middle, after a proper interval. It is easy to scheme a modern reproduction of this method of building a vault or a dome with slabs of expanded metal concrete, prepared in advance for the purpose, laid upon a wood or iron latticed centring. A thickness of 4 inches at the top, in two 2-inch blocks, would probably be ample for any retort-house span. The question would, of course, be settled by experiment; but the capabilities of the system for cheap building are self-evident.

Having led the reader thus far, we will engage his attention for the accompanying diagram, which is a cross-section (not drawn to scale) of a brick-built and concrete roofed retort-house with flanking coal-stores, of the usual pattern.



All that it is necessary to say by way of describing the sketch is that only the upper part is shown; and that while the middle space, for the retort-house proper, is supposed to be covered with a plain span of elliptical form, the abutting covering of the coal stores, which takes the thrust, is a series of domes vaulted into one another. The assistance of a capable architect would be needed to give the proper finish to the elevations of the sides and ends. A little bit of Byzantine feeling, but not too much, would be easy to indicate. Such a retort-house, instead of being an eyesore, would be an ornament to its locality; and it would not be a perishable structure.

It is hardly necessary to remind engineers that the right way to finish off a dome, or a span of this character, is with a hole at the summit, which takes off the weight, and gives light to the interior. The dome of St. Paul's Cathedral is finished with a cupola, colonnade, and other additions which appear to stand upon it, but do not. The outer and inner domes are separate, and between them is a cone of brickwork which takes the weight of the cupola, &c. The best example of Byzantine architecture on a large scale in Europe is the new Roman Catholic Cathedral at Westminster, which to English eyes has no distinctively ecclesiastical aspect. It is a fine specimen of modern brick and concrete construction. The cost per cubic foot of content is not known to the writer; but it must be far lower than any possible alternative building.

According to an announcement in the "London Gazette," the King has been pleased to grant to Sir John Aird, Bart., M.P., His Majesty's royal licence and authority to accept and wear the Grand Cordon of the Imperial Ottoman order of the Medjidieh, conferred upon him by His Highness the Khedive of Egypt, in recognition of his valuable services in connection with the recently completed Nile reservoirs. His Majesty has likewise been pleased to grant to Maurice Fitzmaurice, Esq., lately Superintending Engineer of the works of the Assouan dam, and now Chief Engineer of the London County Council, His Majesty's Royal licence and authority to accept and wear the Insignia of the Second Class of the Imperial Ottoman Order of the Medjidieh, also conferred by the Khedive, in recognition of valuable services rendered to the Egyptian Government.

THE MOND POWER-GAS PROCESS.

A Plain Description and Statement.

THERE has never, so far as we are aware, been for the busy reader a compendious and readily intelligible publication on the subject of, and the many facts surrounding, the process and patents of Dr. Ludwig Mond for the generation of gas from cheap bituminous small coal or slack and the recovery of the ammonia. There come to mind several papers contributed to various professional societies the theme of which has been the Mond process; but these have been (without exception it is safe to say) so full of technical detail that their subsequent reproduction in the Press, in whole or in part, has excited little interest, save in the case of those intimately and directly concerned. The subject is eminently one which requires to be treated first in a popular manner in order to stimulate a general interest in its more scientific aspects—even, there need be no hesitation in saying, among a large majority of the engineers and managers who direct the ordinary gas supply of our cities and towns. They of all men should certainly have a knowledge of the properties and qualities of the process, and of its claims and aims. There are two living facts which should arrest their attention; and if these will not do so, then nothing will. The

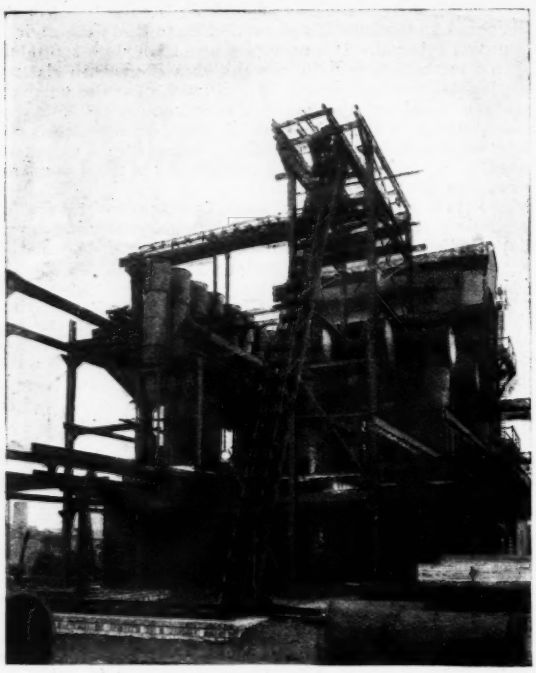


FIG. 1.—THE COAL ELEVATOR AND CONVEYOR AT THE FARNLEY IRON-WORKS, NEAR LEEDS.

first is there are already in operation and now in course of construction installations of the Mond and Duff producer systems equal to no less than 270 million cubic feet of gas per day; and the second is that the South Staffordshire Mond Gas Company (whose parliamentary area of supply comprises 123 square miles) are actively pushing forward the construction of their first station, which will have a daily productive power equal to 40 million cubic feet of Mond gas. As most readers are no doubt aware, the Mond and Duff processes and patents are controlled by the Power Gas Corporation, Limited; and it is from an early proof with which we have been favoured of a richly illustrated pamphlet they are about to issue that this article—giving, without criticism or question, a comprehensive account of their system and the points advanced in its favour—has been compiled.

That the Mond process for the conversion of slack into combustible gas, and for the simultaneous recovery therefrom of sulphate of ammonia, is a commercially successful one there can be, in face of the two facts already given, no disputing. Like all other similarly successful processes, it had a very small beginning. It was first put into operation at Messrs. Brunner, Mond, and Co.'s works at Northwich. The original apparatus was only intended to gasify a few hundredweights of slack per hour. From this relatively small beginning, the gas-producer plant at Northwich was step by step enlarged and extended, in order to meet the ever-increasing calls that were made upon it as (says the informative pamphlet before us) its many advantages were recognized and appreciated, until at the present time it is capable of gasifying daily some 250 tons of slack, from each ton of which there is obtained the ammonia-equivalent of about 90 lbs. of sulphate of ammonia, and from 140,000 to 160,000 cubic feet of Mond gas, equal to about 37 million cubic feet per day. The immense

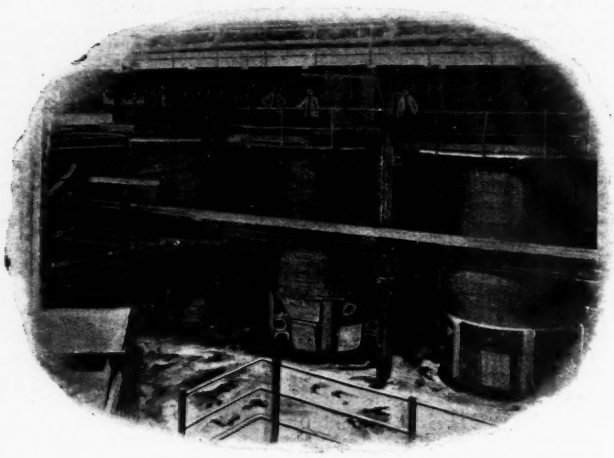


FIG. 2.—SOME GAS PRODUCERS AT MESSRS. BRUNNER, MOND, AND CO.'S WORKS, WINNINGTON, CHESHIRE.

volume of gas thus generated day by day is employed in a variety of ways. It provides fuel for heating and evaporation, and is also put to many other uses suited to the special requirements of the chemical industry there carried on, including some of the most important operations of the works, dependent for their success upon the absolute reliability and constancy of the gas. The gas is used for heating the offices, and for cooking the workmen's dinners; and it also provides fuel for the large gas-engines that are employed for the generation of electricity for the works and for lighting the neighbouring township of Northwich.

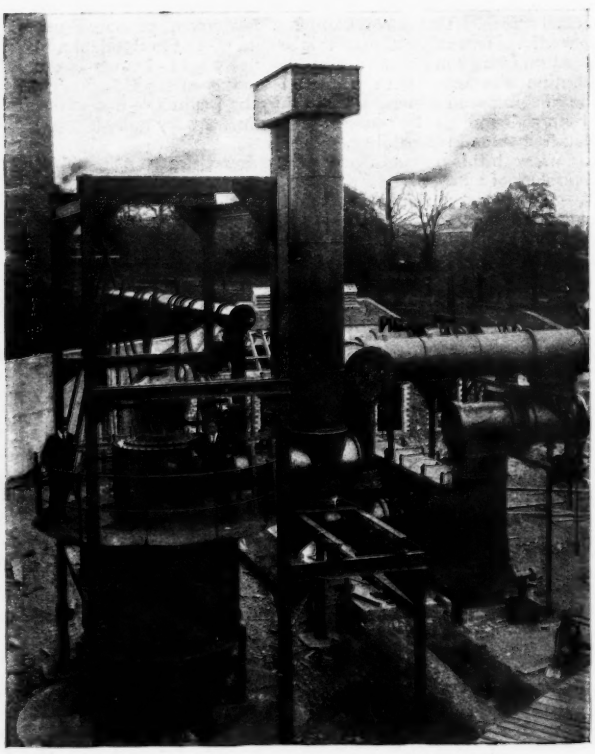


FIG. 3.—VIEW OF THE GAS PLANT AT THE WORKS OF THE UNITED TURKEY RED COMPANY, LTD., ALEXANDRIA, N.B., SHOWING THE WATER SEAL TO THE PRODUCER.

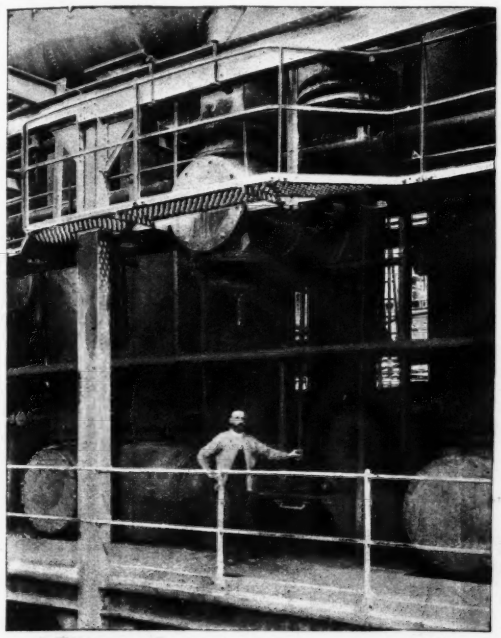


FIG. 4.—REGENERATORS AT MESSRS. BRUNNER, MOND, AND CO.'S CHEMICAL WORKS AT NORTHWICH, CHESHIRE.

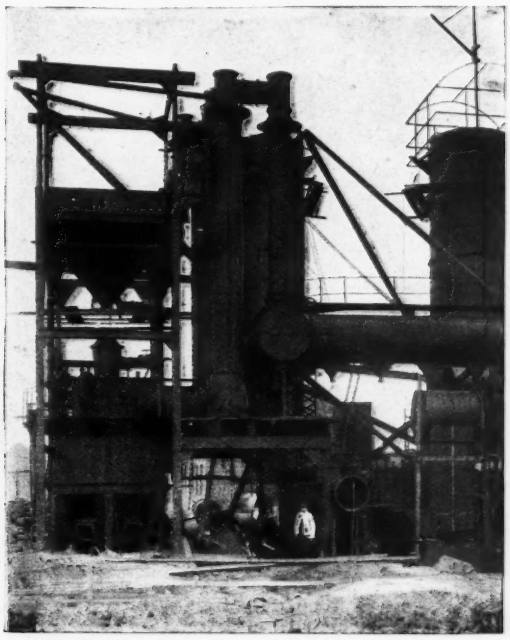


FIG. 5.—VIEW OF THE GAS PLANT AT MESSRS. MONKS, HALL, AND CO.'S WORKS, WARRINGTON, SHOWING THE PRODUCERS AND REGENERATORS.

Turning from this pioneer installation, and its remarkable development, we find the most explicit description of the Mond method of gas production and ammonia recovery that has yet come before us; and it takes us from the alpha to the omega of the process in a very concise fashion. Wherever possible, the slack to be gasified is discharged direct from the railway-trucks into an elevator-boot. From this, it is mechanically elevated to the storage hoppers above the producers (fig. 1), and from the hoppers it is fed into the producers, where the combustible matter is converted into gas (fig. 2). The producer is provided with a water-seal (fig. 3), and is so constructed as to allow the ash (which is the only residue) to descend into the water, from which it is easily removed without interfering in any way with the working of the apparatus. The process of combustion in the producer is carried out at a comparatively low temperature, with the twofold object of preventing the formation of clinkers, and of providing against the destruction of the ammonia. This is accomplished by introducing into the producer a blast of hot air and steam. The quantity of steam required, when it is desired to recover the ammonia from the gas, is equal to $2\frac{1}{2}$ tons for every ton of fuel gasified. But of this about 1 ton is automatically recovered in the way to be hereafter described; and this is used over and over again. In the case of installations where it is not proposed to recover ammonia, the quantity of steam necessary is reduced to about 1 ton for each ton of fuel gasified.

After leaving the producer the gas passes through a regenerator, so arranged that part of the heat of the gas and steam entering it is transferred to the blast of air and steam on its way from the air-heating tower to the producer; the gas being consequently cooled to a corresponding extent. (Figs. 4 and 5.) The gas is then delivered into a mechanical washer—a rectangular iron chamber—where it is thoroughly washed with water thrown up into a fine spray by a system of rapidly revolving dashers. (Figs. 6 and 7.) By the intimate contact thus obtained with the water, the temperature of the gas is still further reduced; and all the dust and sooty substances are washed out of it. These are easily removed by an arrangement of lutes in the side of the washers.

The gas having been washed in this manner, the next step is the recovery of the ammonia contained in it; and for this purpose the gas passes through the acid-tower. While the gas is travelling through this, the ammonia is almost completely washed out by a weak solution of sulphuric acid, with which it enters into combination—thus forming sulphate of ammonia. This acid solution of sulphate of ammonia circulates through the tower again and again, until it contains from 36 to 38 per cent. of sulphate of ammonia. In order to provide for the continuity of the process, fresh supplies of sulphuric acid are from time to time added; and corresponding quantities of the sulphate liquor are withdrawn and then evaporated—thus yielding solid sulphate of

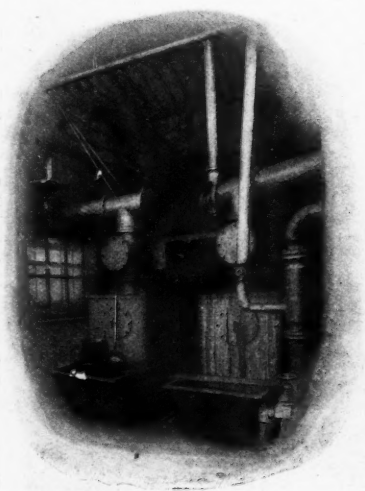


FIG. 6.—SMALL MOND GAS WASHERS AT MESSRS. CROSSLEY BROS.' WORKS, OPENSHAW, MANCHESTER.

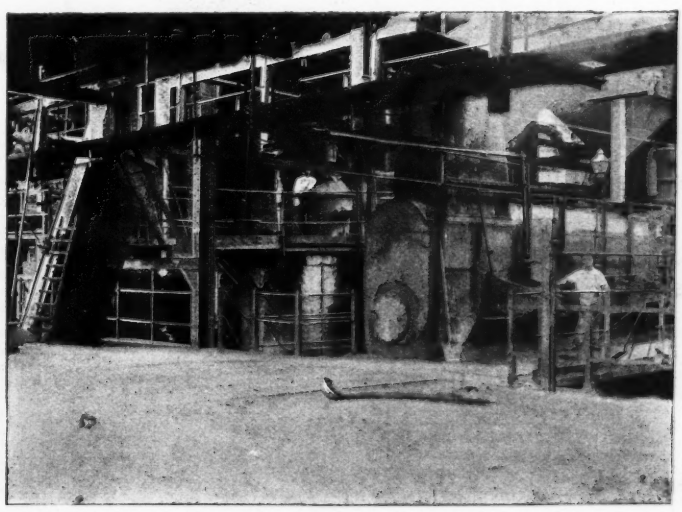


FIG. 7.—MECHANICAL GAS WASHER AT MESSRS. BRUNNER, MOND, AND CO.'S CHEMICAL WORKS AT NORTHWICH.

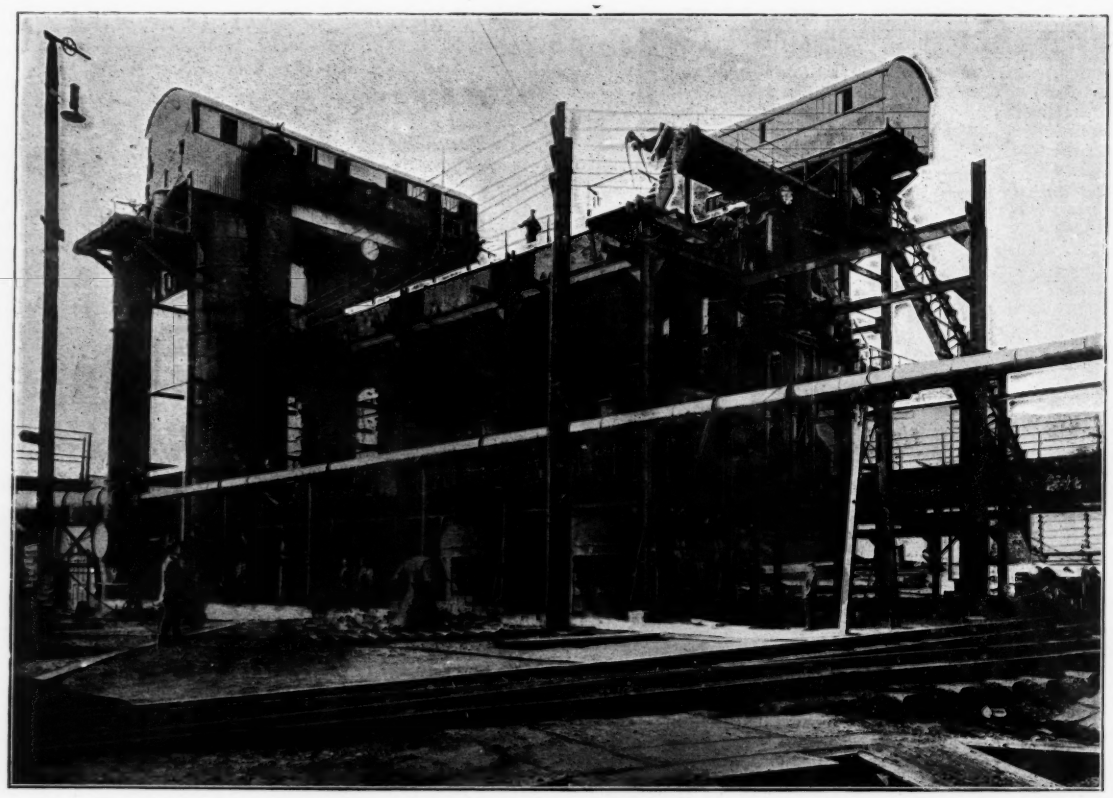


FIG. 8.—VIEW OF THE MOND GAS PLANT AT THE FARNLEY IRON-WORKS, LEEDS.

ammonia of good quality, which finds a ready sale. (The acid tower is shown, with the air-heating and the gas-cooling towers referred to in the next paragraph, on the left-hand side of the view of the plant at the Farnley Iron-Works—fig. 8.)

Having now given up its ammonia, the gas is next passed through the gas-cooling tower, where it is subjected to a further cooling and cleaning by means of a downward flow of cold water. It is then ready for use, and passes direct into the mains leading to the works. As the gas is cooled in this tower, the steam with which it was burdened becomes condensed, and the water which entered the tower as cold water is delivered from it as hot water. This is again pumped (fig. 9) to the top of the neighbouring air-heating tower, where it serves to heat the air-blast required for the producer. Into this air-heating tower, a blast of air is forced by a blower; and its contact with the descending stream of hot water results in the production of a hot-air blast saturated with vapour

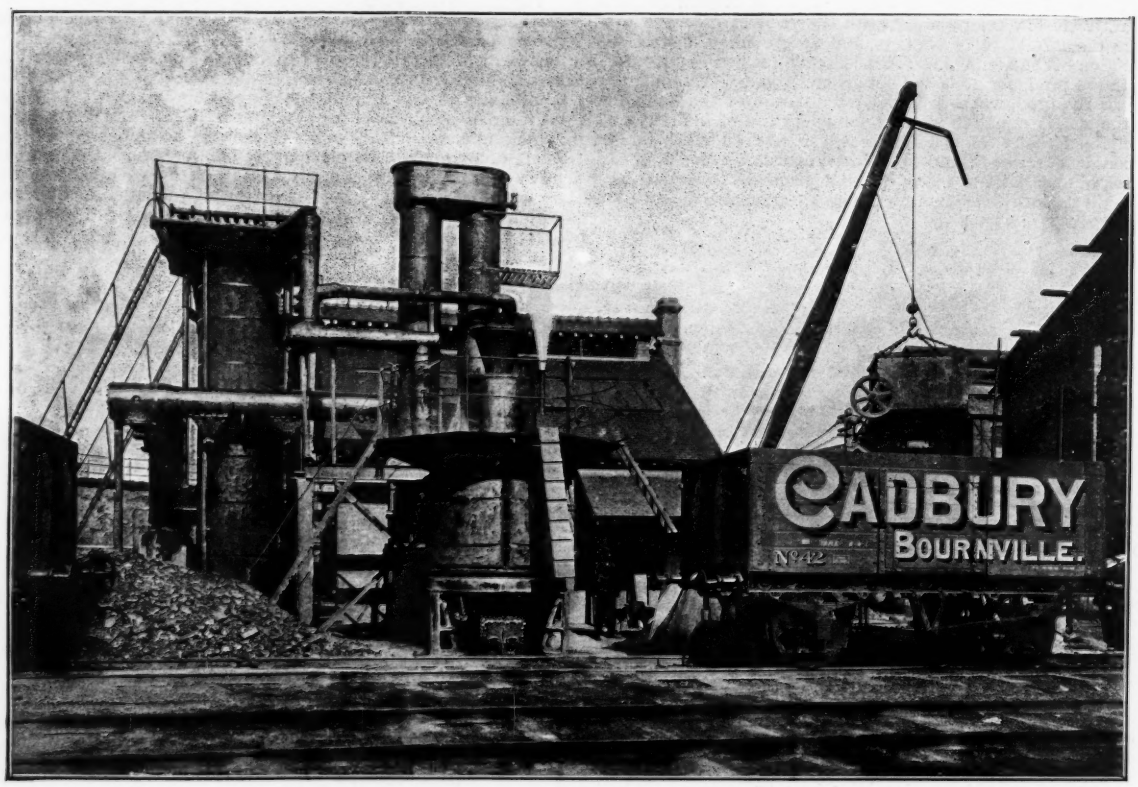


FIG. 11.—VIEW OF THE MOND GAS PLANT IN MESSRS. CADBURY BROS.' WORKS AT BOURNVILLE, NEAR BIRMINGHAM.

which is duly carried into the regenerator, and thence delivered into the producers as already described. The water which was delivered hot into the top of the air-heating tower, after having transferred its heat to the air-blast, is drawn off sufficiently cold at the bottom, to be returned to the top of the gas-cooling tower, to repeat its cycle of utility. This method of continuously employing the water in circulation as the heat-carrying agent between the hot gas in one tower and the cold air in another, and the method of recovering from the hot gas (by this continuous cyclical exchange of heat) a large proportion of the steam required for the producer-blast, form distinctive features in the economy of the process.

The gas produced by the process, as thus briefly described, has the following average analysis and calorific value, compared with illuminating gas:—

	Mond Gas.		London Illuminating Gas.
Volume per cent. (gases saturated at 15° C.)—			
Carbonic oxide	11·0	..	7·8
Hydrogen	27·5	..	52·9
Marsh gas	2·0	..	31·8
$C_n H_{2n}$ + benzol	*nil*	..	5·0
Carbonic acid	16·5	..	*nil*
Nitrogen + moisture	43·0	..	2·5
Total volume	100·0	..	100·0
Total combustibles	40·5	..	97·5
Calorific value (gas dry at 0° C.)—			
In kilogram calories per cubic metre	1392·2	..	5823·3
In British thermal units per cubic foot	156·3	..	641·9

The advantage-claims for the gas are many and striking; and as it is important that gas engineers should know precisely their nature, they may be set forth *in extenso* as submitted by the Power-Gas Corporation: "(1) The gas is produced from the cheapest quality of coal—slack or dross—thus obviating all necessity for expensive steam coal for the generation of power in the works. (2) The amount of labour required for its production is extremely small. (3) Its heating value is equal to from 81 per cent. to 86 per cent. of the total heat energy contained in the fuel used for its production. (4) Its cost, when produced on a large scale, is less than ½d. per 1000 cubic feet. (5) One ton of rough slack produces about 150,000 cubic feet of power gas of a calorific value of 140 British thermal units per cubic foot. (6) The quantity of gas required to produce an indicated horse-power-hour in a large gas-engine is about 60 cubic feet. (7) When gasified and used in a large gas-engine, 1 ton of slack gasified is sufficient to produce about 2500 indicated horse-power-hours, or 2500-horse power for one hour. (8) By using the gas in gas-engines, a given quantity of fuel will produce about four times the power obtainable from it with ordinary steam-engines. (9) Gas-engines producing upward of 30,000-horse power were running with Mond gas in January last, or were being installed. (10) The fuel-cost of an indicated horse-power-hour, obtained from a gas-engine running with Mond gas generated from slack at 6s. per ton, is $\frac{1}{10}$d. (11) It is the best for gas-engines, because they require a clean gas of regular quality. It is interesting to note that a gas-engine of 150-horse power has been kept running with Mond gas, day and night, for six months without stoppage. (12) In every steam plant working with a variable or intermittent load, a considerable portion of the fuel consumed is wasted. Some loss under this head is unavoidable; but the employment of power-gas reduces such stand-by losses to a minimum. It is therefore very advantageous for intermittent working. The stand-by losses of a 1000-horse power plant are about 2 cwt. of fuel per night of fourteen hours. When standing for eight days, the stand-by losses of a 1000-horse power plant are at the rate of only about 7½ lbs. per hour, and the plant can be re-started in a very few minutes. (13) After the week-end stoppage, the time required for starting is only three minutes for a plant generating 1000-horse power. (14) Its employment abolishes the smoke nuisance. (15) It is delivered cool and clean from the apparatus, and can be carried considerable distances, and delivered at any number of places. (16) The gas is regular in composition, and the supply from the producers can be regulated in accordance with the variable requirements of the engines, stoves, or furnaces, thus preventing waste. (17) By the recovery of sulphate of ammonia, a large proportion of the initial cost of the fuel is saved. The quantity of it obtained amounts to about 90 lbs. per ton of fuel gasified. (18) Owing to its cleanliness and regular composition, the gas is invaluable in all heating operations in which the flame comes into direct contact with the products to be heated. (19) The use of gas in a furnace ensures the maintenance of a perfectly even temperature. (20) It is an ideal gas for metallurgical purposes; an oxidizing or reducing flame being obtainable at will, and containing a higher percentage of hydrogen and a smaller percentage of carbon monoxide than any other producer gas, it is therefore less poisonous. (21) By employing regeneration, extremely high temperatures are easily obtained."

In conjunction with the foregoing, the following is a useful table, showing the daily fuel consumption of various sized plants,

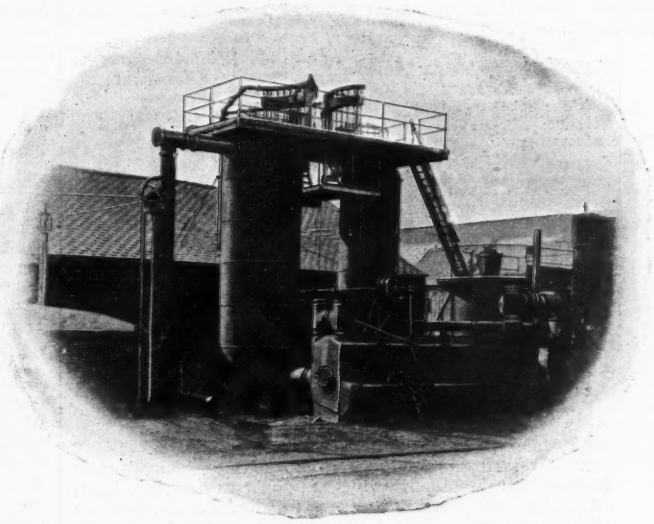


FIG. 10.—GAS PLANT AT THE WORKS OF THE PREMIER GAS ENGINE COMPANY, SANDIACRE, NEAR NOTTINGHAM.

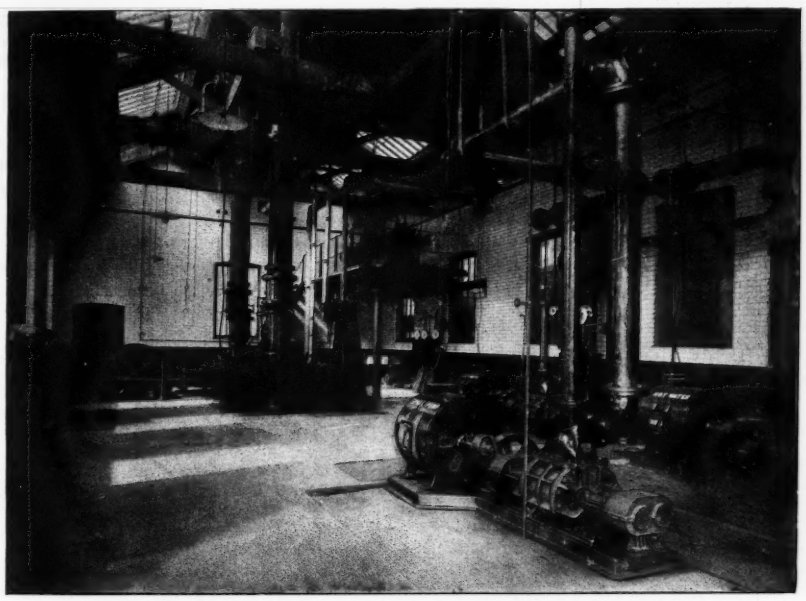


FIG. 9.—PUMP-HOUSE AT THE FARNLEY IRON-WORKS, NEAR LEEDS.

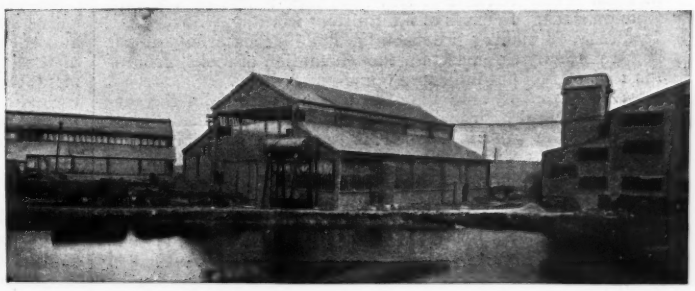


FIG. 12.—VIEW OF THE PARKFIELD WORKS, STOCKTON-ON-TEES.

and the approximate equivalent in horse power to be obtained therefrom:—

	Without Apparatus for Ammonia Recovery.		*With Apparatus for Ammonia Recovery.*	
	Fuel per 24 Hours.	Horse Power.	Fuel per 24 Hours.	Horse Power.
Fuel consumption	2½ tons	250	30 tons	3,000
,, ,,	5 ,,	500	40 ,,	4,000
,, ,,	7½ ,,	750	60 ,,	6,000
,, ,,	10 ,,	1,000	80 ,,	8,000
,, ,,	15 ,,	1,500	100 ,,	10,000
,, ,,	20 ,,	2,000		
,, ,,	30 ,,	3,000		

In connection with the use of the gas for motive power, the demand for plants of comparatively small capacity is a growing one; and the Power Gas Corporation are now constructing them of 250-horse power and upwards. It is, however, obvious that the majority of these are not of sufficient capacity to warrant the inclusion of ammonia-recovery plant. Fig. 10 shows a gas plant equal to the production of 1000-horse power now in use at the works of the Premier Gas-Engine Company; and fig. 11 is a 500-horse power plant the gas from which is used in Westinghouse gas-engines at Messrs. Cadbury Bros.' works at Birmingham. These comparatively small plants, it is stated, are capable of being worked with a widely varying load-factor (even down to one-sixth load) without sacrifice of economy; and tests that have been made show that, under extreme conditions, the gas remains practically constant, both as to the composition and as to the quantity yielded per ton of fuel fed to the producer. They are also constructed in such a way as to require only a minimum amount of labour and supervision; and it will be seen from the subjoined tables that the cost of labour in actual practice is extremely small:—

Statement of Annual Working Cost of a 1000-Horse Power Plant, Working Continuously at Full Load for 365 Days (of 24 Hours).

Total fuel 4211 tons, including that required to raise steam for the machinery and producers, &c. (evaporation 6½ lbs. per pound of fuel), at 6s. per ton	£1263 6 0
Labour—three men (per day of 24 hours) each working one shift of eight hours	246 7 6
Other expenses, including maintenance, repairs, cost of oil, waste, stores, and sundries	195 12 6
Total working cost per annum	£1705 6 0
Cost of available gas per 1000 cubic feet	0·778d.
Cost of one indicated horse power per hour	0·0467d.
Cost of one indicated horse power for one year of 365 days of 24 hours	£1 14 1½
If coal be taken at 8s. per ton—	
Cost of available gas per 1000 cubic feet	0·9662d.
Cost of one indicated horse power per hour	0·0582d.
Cost of one indicated horse power for one year of 365 days of 24 hours	£2 2 6½

Statement of Annual Working Cost of a 1000-Horse Power Plant Working Intermittently, say 300 Days per Annum, for Twelve Hours per Day, at an Average of Two-Thirds of the Full Load.

Total fuel 1200 tons, including that required to raise steam for the machinery and producer (evaporation 6½ lbs. per pound of fuel), also for stand-by losses for 65 days of 24 hours and 300 nights of twelve hours, at 6s. per ton	£360 0 0
Labour—one man at 5s. per day for 300 days	75 0 0
Other expenses, including maintenance, repairs, cost of oil, waste, stores, and sundries	118 15 0
Total working cost per annum	£553 15 0
Cost of available gas per 1000 cubic feet	0·8847d.
Cost of one indicated horse power per hour	0·0533d.
Cost of one indicated horse power for one year of 300 days of twelve hours	16s. 0¼d.
If coal be taken at 8s. per ton—	
Cost of available gas per 1000 cubic feet	1·1184d.
Cost of one indicated horse power per hour	0·0674d.
Cost of one indicated horse power for one year of 300 days of twelve hours	£1 0 3

On the subject of gas-engines, the further information is given that engines of varying sizes (up to 650 indicated horse power) are now working, and indicating a horse-power-hour on a consumption of less than 60 cubic feet of Mond gas, involving the gasification in the producer of less than nine-tenths of a pound of common slack. In cases of intermittent working, with varying loads, and after making provision for stand-by losses and steam raising, a perfectly safe basis for the calculation of fuel consumption is 1 lb. of fuel per indicated horse-power-hour.

It is interesting to note that the steam required for the gas-plant can be raised by utilizing the heat contained in the exhaust gases leaving the gas-engines. This increased economy is an important consideration; and more particularly so in the case of central stations employing gas-engines. Formerly the heat of the exhaust gases was wasted; and the steam necessary for the saturation of the producer blast had to be raised in the ordinary way. Results recorded with a 500-horse power gas-engine show that, by passing the exhaust gases through a specially designed tubular boiler, their heat can be so efficiently utilized as to provide all the extra steam required in the producer to furnish the supply of gas necessary for the gas-engine—thus increasing the fuel economy of the system by some 20 per cent. This system of raising steam has already been adopted in one installation where Mond gas is used to drive large gas-engines producing several thousand horse power, and no trouble or difficulty is experienced in working.

In this article we cannot enter into all the information furnished as to the application of power gas to central electric stations, nor as to its usefulness in connection with numerous manufactures. The South Staffordshire Mond Gas Company will shortly have an opportunity of proving the advantages of the gas in many industrial operations, and also the possibility of profitably distributing the gas on a large scale over an extensive district. As already stated, their parliamentary area comprises 123 square miles; and, in all probability, six central stations will be constructed for the supply of the district. The first one will be capable of producing about 40 million cubic feet of gas a day. The complete installation throughout the district is estimated to cost £800,000.

In conclusion, it may be mentioned that the Power Gas Corporation have secured for the construction of their plants the Parkfield works of Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees (fig. 12); and three of the former Directors of the firm—Mr. R. Seymour Benson, Mr. R. Russell Crewdson, and Mr. Edward Lloyd Pease—are on the Board of the Power Gas Corporation, which is now the Board of Ashmore, Benson, Pease, and Co., Limited. The Parkfield works cover rather more than 8 acres; and, situated as they are in the midst of the Cleveland district, within easy access of the neighbouring Durham coal-fields, they are particularly well-placed for the production, under the most favourable conditions, of the plant supplied by the Corporation.

The photographs illustrating this article were kindly supplied by the Power Gas Corporation, Limited. In a subsequent issue, an article will be published dealing with the Duff patents, which, as already mentioned, are also owned by the Corporation.

BUSINESS TRAINING FOR THE ENGINEER.

THE new President of the Stevens Institute of Technology—Dr. Alex. C. Humphreys, M.Inst.C.E.—lost no time in making known as widely as possible his views on a subject which touches very closely those who will come under his control as the head of the above-named important educational establishment. Primarily, of course, their object will be the study of technics; but Dr. Humphreys recognizes that, however successful they may be as technicians, their professional progress will be hampered if they are not also good men of business. He has dealt with this side of the education question in an article in a recent number of "Cassier's Magazine," to which we have pleasure in directing attention.

He begins his dissertation by pointing out that when the proposition that the engineer ought to be a man of business, or at least be informed of, and prepared to conform to, business conditions and methods, is squarely laid down, its truth should be self-evident to the majority of men who have succeeded in both capacities. The man who is capable of bringing to the service of his clients a sound technical training as well as ability to meet business conditions, proves by his comparative success the material value of this dual capacity. At present its possession is the exception, whereas, for the sake of the engineering profession and the country at large, it should be the rule. In order to bring about this desirable state of things, we are assured that "the professional educator and the engineer student must better recognize the conditions to be met in practice;" and that everything possible should be done in technical schools to harmonize practice and theory. Dr. Humphreys considers that the lack of sufficient technical training in Great Britain has resulted in the loss of her commercial supremacy. As, after graduation, the young engineer will possibly be influenced, by commercial conditions, to become a specialist, his practice, in his selected branch of his profession, should be in harmony with those conditions; but he should not aim to be the commercial manager. All he needs—and this is all the schools can teach him—is "a broad training in fundamentals," upon which he can safely and expeditiously build when he is called upon to do so. This, it seems to us, should have been the aim of the reformers of our own educational system. But instead of it they have introduced a complicated *curriculum* which the mental receptivity of the scholars is in a large majority of cases unequal to assimilating. The aphorism of the philosopher (was he a Greek?) who said: "We learn not for school but for life," has been reversed. Children learn not for life, but for "exams."

Going into his subject in detail, Dr. Humphreys remarks that perhaps the matter of primary importance to engineering students is accounting—a sound knowledge of the principles of double-entry bookkeeping being necessary to enable them to exercise a close, intelligent, and independent supervision over manufacturing cost. Then they should be taught to discriminate between the charges to be placed to capital and revenue respectively, and they should be warned of the ease with which errors can be made in this connection, and the disastrous

consequences that are likely to follow their commission. They should be shown the necessity for making adequate provision for depreciation of plant, and it should be impressed upon them that books can be so kept, either through ignorance or design, as to conceal the facts, and apparently justify the payment of dividends unearned. In the course of his professional work, the engineer will be called upon to make reports; and therefore Dr. Humphreys points out that it is of the first importance that students should be brought to "a keener appreciation of the value of a working command of English." They should be made to understand, he says, that it is not enough to possess the necessary knowledge; "they must also have the ability to convey to others, and especially to their clients, in language concise and free from ambiguity, the results of their professional or administrative work." What a gift this is! How often has it been the fate of those whose business it is to prepare technical papers for the Press, to find a writer losing himself in a maze of words, and finally bringing his long and complicated sentence to a close without completing the statement he started to make. No amount of punctuation will make clear what is obscurely expressed; and therefore we cordially agree with Dr. Humphreys in the following remarks on this matter:—

Unquestionably there is a crying need for more efficient work in the teaching of English in the schools of technology; and perhaps this statement may fairly be extended to include some of the colleges and universities. Reform in this direction is most difficult of accomplishment. The work performed is too often of a perfunctory character, whereas it should be characterized by enthusiasm and originality. The time available is limited; and therefore the first care should be to give such a training in English as will be most efficient to meet the requirements of professional practice.

Another feature which may well be included in the department of business methods is instruction in the law of contracts, not to enable an engineer to dispense with legal assistance—for Dr. Humphreys knows perfectly well what kind of client a man has who is his own lawyer—but to put him on the alert as to the dangers to be encountered, and to enable him to recognize when it is advisable to seek thoroughly competent advice.

We will now let Dr. Humphreys state in his own language what is being done in the Stevens Institute in the direction of making the students good business men as well as thorough technicians:—

A course in business methods was started in 1897, though it was not until two years later that the work was put upon a firm basis. At first a number of engineers and bankers gave a series of lectures to the senior class, to point out, by examples from their own professional and business experiences, the necessity for the engineer to recognize that his work must be in accord with commercial practice. Two years later, ten lectures on accounting were delivered to the junior class; but as this work was left optional, the students derived little benefit from it. For the last three years the course has included twenty lectures and recitations, followed by regular examinations. It is believed that this course has been of real value, and could have been made of far more value if the students in the first few lectures could have been brought to believe that this is a subject which properly belongs to a course of engineering. Now this part of the *curriculum* has been again carried forward to the senior year. It is hoped and believed that from now onwards this feature of the *curriculum* will be of much greater value to the students, because the first few lectures will be delivered by successful engineers and business men who have in their work demonstrated the necessity, or at least the advisability, of such training. It is believed that the students will be ready to accept such testimony, and act upon it, where they would not do so if the advice were offered by professional educators or accountants. As it is important that the first year's class should be promptly impressed with the practical necessity for such a knowledge of English as has been already spoken of, a few talks will be given to the entering classes to bring them into a more sympathetic and receptive mood towards this and all other non-technical studies included in the *curriculum*.

Dr. Humphreys says that, as a general rule, "the entering class, in their wisdom," are ready to promptly denounce as useless or out of place these non-technical studies; and consequently "the sympathetic co-operation of the students, which is such an important element in the efficient teaching required in a full course of study, is not obtained, and the foundation is laid for many regrets to be experienced in the years after graduation." It is to be hoped future students may be spared these regrets.

ELECTRIC LIGHTING MEMORANDA.

The Waste of Electricity Distribution—Mains and Meters—Miscellaneous Effects—Importance of the "Density Factor"—Marconigrams.

THE subject of the wastage in electrical distribution has been seriously discussed at a meeting of the Institution of Electrical Engineers; it being apparently felt by members of the profession that a constant loss in the distributing plant, over the most compact areas, of 25 per cent. of the output of a generating station, is hardly creditable to so scientific an industry. Of course, the gas industry is comparatively but a crude and unscientific business; it nevertheless contrives to give a very much more complete account of its raw material and also of its output than electricians can boast. Perhaps the gentlemen who follow this calling do not realize how adequately, as a rule, a well-looked-after gas undertaking can trace its product. They are probably under the impression that the 5 and 6 per cent. of unaccounted-for gas which the best working in ordinary practice admits, is actually represented by lost gas, much of it doubtless wandering about in the endeavour to get into electric light conduits and make trouble there. As a matter of fact, it is largely a figure of account, in which a multitude of things are represented, and is more nearly akin to the analytical chemist's make-up entry than to anything else. In electricity distribution, however, there is no mistake about the waste that goes on, as much of it is in the peculiarly objectionable form of local heating—that is to say, in the totally unnecessary work of warming up the cables, and in the transforming apparatus in the case of alternating systems.

In the special example of Croydon, which serves as the text for the Institution paper on the subject, the transformer losses alone are very large, and do not seem to be reducible by the exercise of any degree of watchfulness and ingenuity on the part of the electrical engineering staff. The most exasperating of all the ways of wastage, however, must be that by the consumers' meters, if only because this is a point upon which the public have to be let into the secrets of the trade. It has come to be fully understood by electric lighting station engineers all the world over, that the financial salvation of the business depends upon the sale of current by meter. Even in the United States, which held out upon the original rental system until quite recently, it has been found that putting in a meter means getting more money out of the consumer—which is the main thing. Where a consumer would pay (say) after the old rate of 1s. per nominal candle light per annum, he has to pay, and as a rule will cheerfully pay, half as much again. But he draws the line here; and when the registrations of the meter have to be corrected out of the inner consciousness of the supply company for what should be charged, the ordinary man does not like it. Then is the opportunity for the gas company to catch his affections on the rebound.

The electricity losses in distributing cables do not mean much to outsiders when the current so wasted is an alternating one. They mean that the insulation is getting a rough time of it, and that the india-rubber especially is perishing. Everyone who rides a bicycle can easily form a mental picture of what an india-rubber covered cable is like after a few years of comfortable dry heating from the inside. The peculiar wickedness of this core-heating trouble seems to lie in the awkward fact that it occurs equally when the cable is not doing any real work. This is a serious consideration, inasmuch as district mains must be kept charged, even when there is no lighting worth mentioning; and all the time the cable is busily spilling energy in destroying its own insulation. If the direct current were in question, it would be expedient to inquire what becomes of the current; for, like the traditional baby in the story, if not doing anything in particular it is sure to be doing mischief. Let us hope, however, that less waste goes on with the direct current than with the alternating current. Still, there is always some; and it is a peculiar feature of electrolysis that a very little electricity does a great deal of work. Much of it, no doubt, is of a catalytic nature; but that is no consolation when a gas or a water main is the subject operated upon.

Gas engineers will see the point made by Mr. C. Turnbull, who writes from North Shields to the "Electrician" to draw attention to the importance of the "density factor" in an electricity distributing undertaking. What Mr. Turnbull means by the term is the number of points of consumption, or profit-earning, per £1 worth of mains laid. It is another, and a better way, of stating the same consideration usually given in gas statistics as so much consumption, or so many consumers, per mile of main. His "density factor," then, is the number of units of electricity sold per £1 worth of distributing plant laid down. It is one of the fundamental data of the business. If the calculation were made before any electric lighting extensions were passed, the result would be to open the eyes of many local authorities to the consequence of working with an elastic capital account. As it is, they usually never see where they are going until they have arrived; and then the next station on the same line is called Insolvency. It is not very far away, either, being usually quite visible with the naked eye.

It is worth placing upon record that wireless telegraphy across the Atlantic has now entered upon what may be called the commercial stage of development; messages of an ordinary character being freely transmitted and received in an intelligible shape. This triumph of the Marconi system is very wonderful, especially when it is remembered that only a few years ago Sir William Preece, with all the resources of the Post Office at his command, was experimenting upon the transmission of electric signals without wires across a few hundred yards of sea. It is rather remarkable that the practical utilization of Hertzian waves for the purpose under notice has so far surpassed what looked at one time like a much more promising application of electrical "influence"—to lighting. Neither Mr. Tesla nor Mr. Moore, who had this work in hand at the same time, but independently, has been heard of for a long period. It will be remembered that the former, especially, astonished the Royal Institution with a display of lighting effects which for various reasons failed to show staying powers. Of course, this is altogether different from wireless telegraphy; but such matters belong to the same great category of wonders of modern applied science.

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

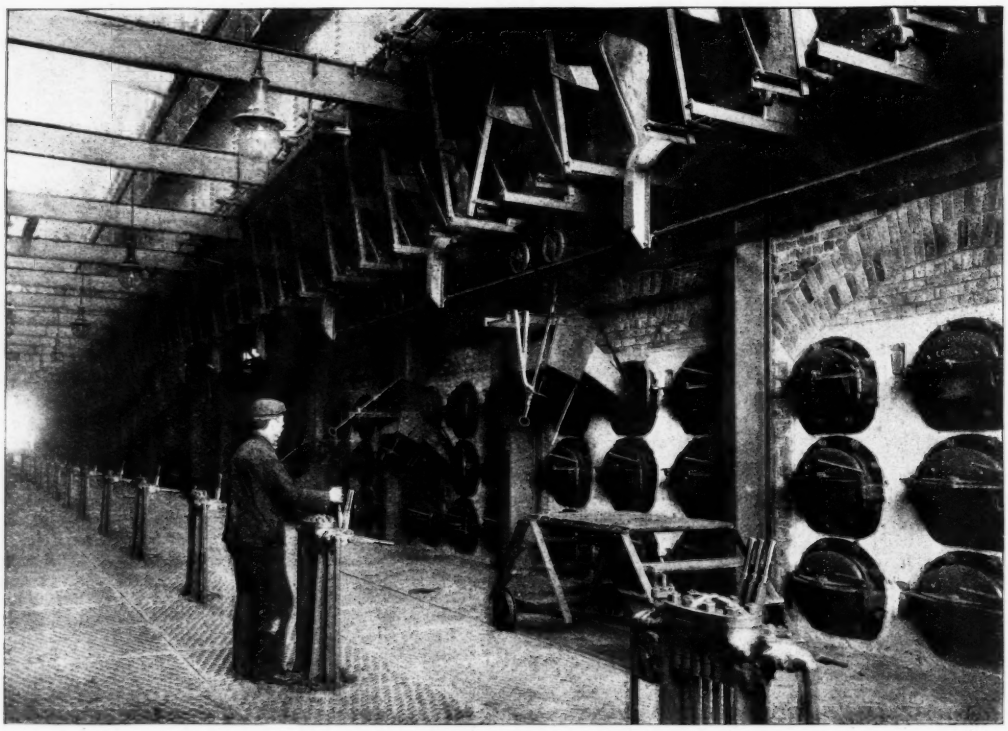
BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE XIV.—Accompanied by Plate No. 15, showing Part Front Elevation of Charging Stage of the 1000 Tons per Day Inclined-Retort Carbonizing Plant, illustrating the Longitudinal Push-Plate Conveyor feeding the Coal Bunkers, Measuring Chambers, Charging Shoots, and General Arrangement of the Charging-End Mouthpieces, Stages, and Back-Bracing to Regenerators.

THE STRUCTURAL STEELWORK (*continued*).

The substitution of hydraulic power for actuating the levers and slides of the measuring chambers has enabled a very considerable modification of the structural work above the charging-stage floor. The transverse joists hitherto required for supporting the levers, frames, and fulcrums, and the two lines of longitudinal channels supporting the lower ends of the measuring chambers have been entirely dispensed with—see Photograph No. 69. It may also be noted that the longitudinal joists supporting the outer sides of the coal-bunkers and the angle steels attached to the bunkers resting upon these joists have also been done away with; the coal-bunker itself forming its own girder from end to end of the bench, in addition to which the measuring chambers are suspended from the base of the same. The general arrangement of the charging stage and the mechanical appliances in connection therewith are illustrated upon Plates 14 and 15. The transverse distributing conveyor receiving its supply from the main elevators at the centre of the retort-house is seen above the curved girder of the main roof (Plate 14) distributing, by spouts, its contents to the four lines of longitudinal conveyors situated above the coal-bunkers. The coal-bunkers are each 7 feet wide



PHOTOGRAPH No. 69.—General illustration of the charging stage, measuring chambers, charging shoots, and hydraulic valves. Each standard comprises six valves for working two settings of retorts.

by 7 feet deep, having the bottom sloping from either side to the centre, and of the same section from end to end. The bottom is built up of $\frac{3}{8}$-inch plate; the two sloping sides having the outer edges flanged for riveting the side plates to, and at the centre for securing the bottom plate with its apertures feeding the measuring chambers. This portion is also stiffened by means of a $\frac{5}{8}$-inch splayed angle-plate running the full length of the hoppers. The flat bottoms of the bunkers really consist of pieces of plate inserted and riveted to $\frac{5}{8}$-inch angle plates, leaving the necessary openings in the positions where the measuring chambers are fixed. The side plates of the bunkers are stiffened by means of $3\frac{1}{2}$ inch by $3\frac{1}{2}$ inch by $\frac{1}{2}$ inch angle steels at the upper outside edges; the hopper being riveted throughout with $\frac{3}{4}$-inch rivets, 4 inches pitch and butt-jointed.

The plates forming the sides and bottom of the hopper are 4 feet in width, running longitudinally, and are butt-jointed, covered internally by means of 5 inch by 3 inch by $\frac{3}{8}$ inch T steel stiffening frames, to which the side plates are riveted. These frames are further stiffened by a double system of 3 inch by $\frac{1}{2}$ inch flat diagonal bracing secured to the web of the T steel stiffening frames by means of $\frac{3}{4}$-inch rivets. The hopper, therefore, forms a box-girder in itself, and is supported from the 16 inch by 6 inch H steel main cross-girders resting upon the heads of the two inner rows of buckstays. Immediately over each main cross girder, a cast-iron splayed bracket is inserted to stiffen and steady this portion of the hopper on each side (Plate 14, fig. 1). The two rows of longitudinal girders under each hopper, together with the angles riveted to the same for supporting them longitudinally over the benches, have been abandoned.

Experience has proved that the "Edinburgh" type of hopper is sufficiently strong in itself to carry the full load; the total capacity of each hopper being 175 tons, or 16 hours' storage. The weight of coal over each 12 feet bay is 12 tons 10 cwt., in addition to which there is the weight of the conveyor and gangway above and the measuring chamber and its attachments beneath. The total weight of metal forming the hopper over a 12 feet bay is 1 ton 19 cwt. 0 qrs. 22 lbs., or at the rate of 350½ lbs. of metal per ton of storage.

The distribution of coal into the bunkers is performed by means of 24-inch push-plate conveyors having apertures arranged in the bottom of the trough, governed by portable slides actuated from the platform running the full length of the bunkers and supported upon 5 inch by 4½ inch by 22 lbs. H steel cross bearers (see Photograph No. 70), resting upon the upper flanges of the bunkers. The conveyor stools are fixed on these bearers, which also act as cross ties to the upper sides of the coal-bunkers, and are spaced 12 feet apart longitudinally. On the inner side, a gangway is constructed by riveting to the 5 inch by 4½ inch cross bearers two angle steels, running the full length of the hoppers, with a stamped-steel plate inserted between. Hand-rail standards

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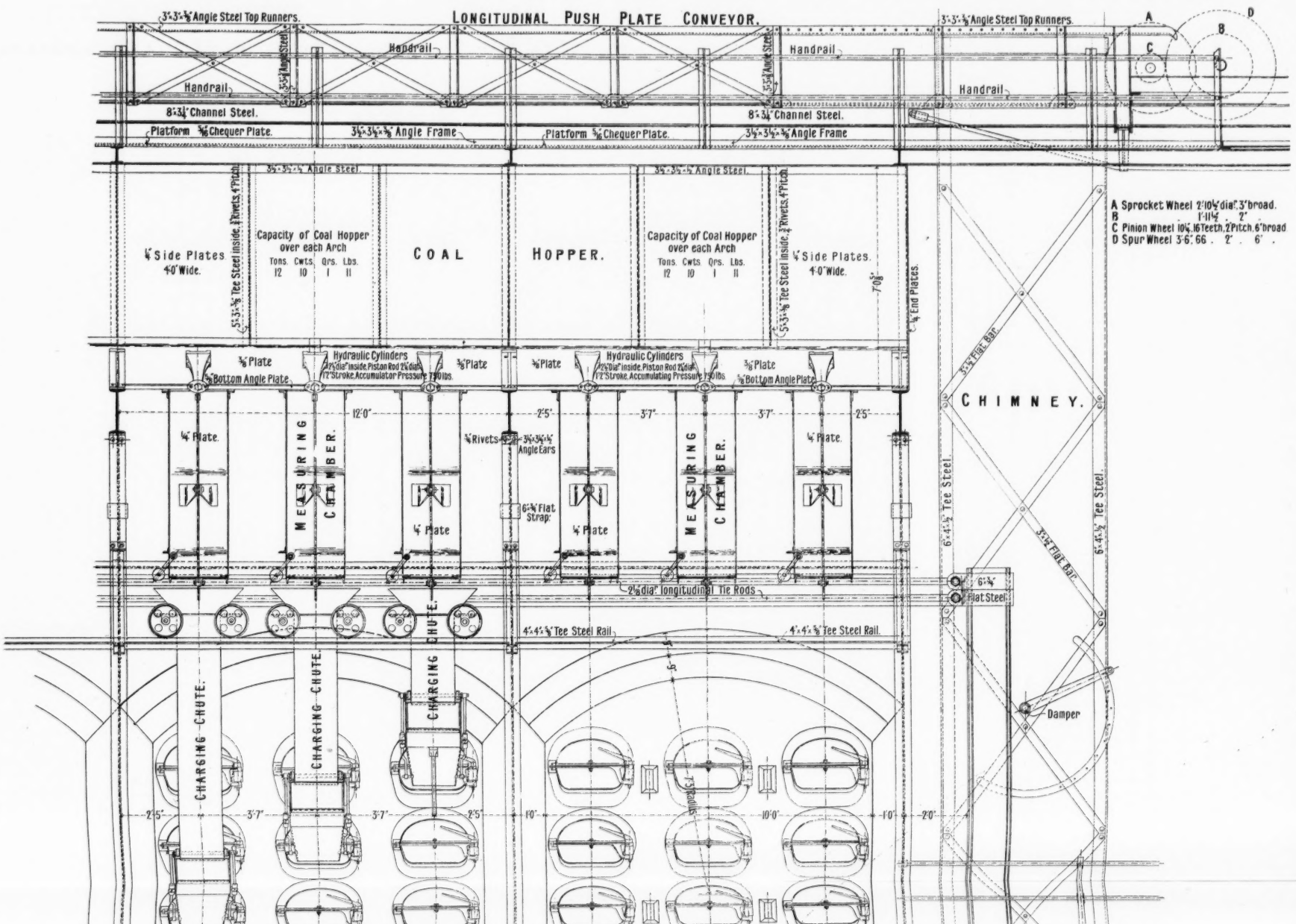
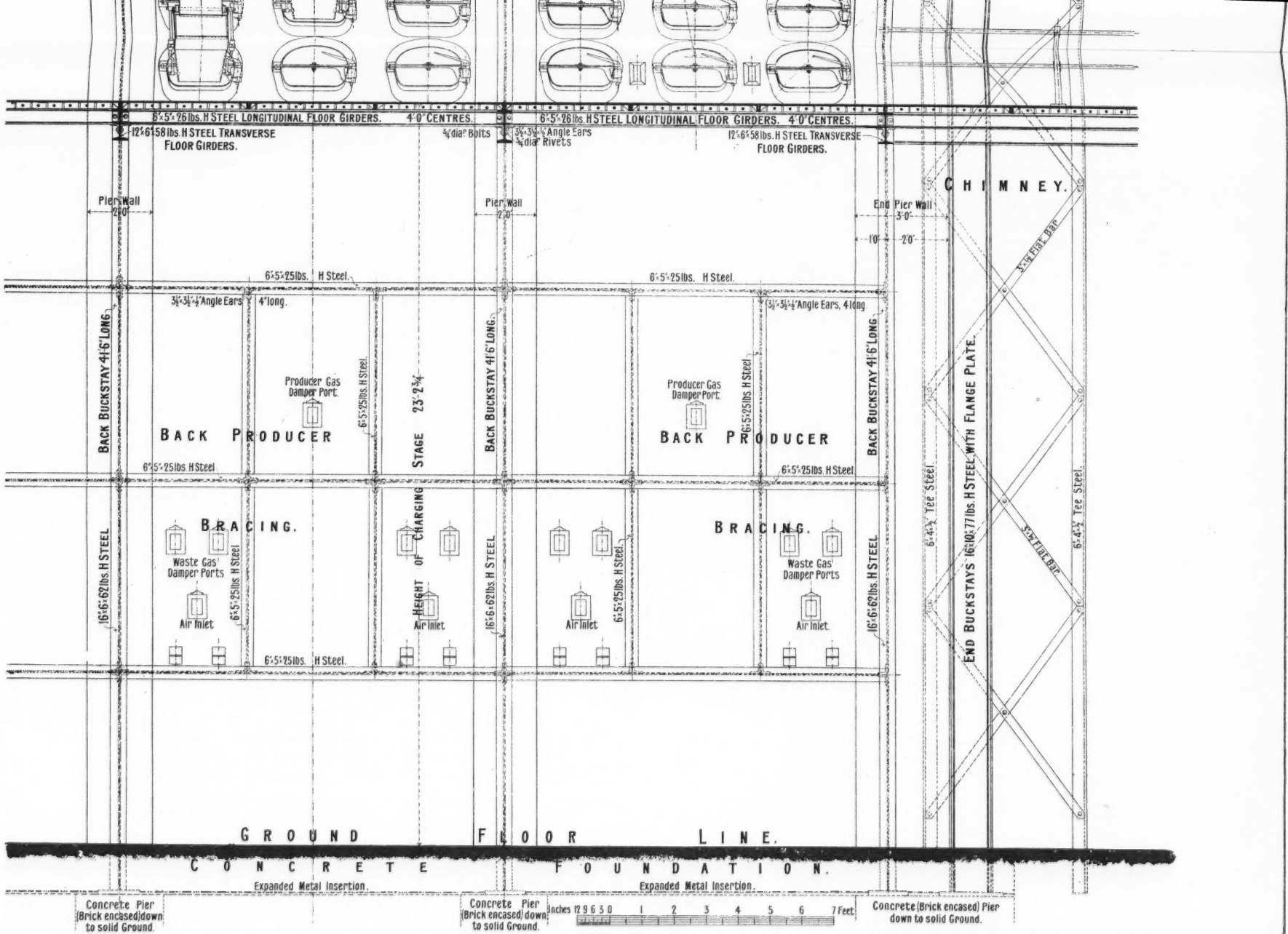
The Granton Works of the Edinburgh and Leith Gas Commissioners.

The 1000 Tons per Day Inclined Retort Carbonizing Plant—Part Front Elevation of Charging Stage. No. 15.




6"×5"×26lbs. H STEEL LONGITUDINAL FLOOR GIRDERS. 4'0" CENTRES.
12"×6"×58 lbs. H STEEL TRANSVERSE FLOOR GIRDERS.
¾" dia. Bolts
3½"×3½"×½" Angle Ears ¾" dia. Rivets
CHIMNEY.
Pier Wall 2'0"
End Pier Wall 3'0"
1'0"
2'0"
6"×5"×25lbs. H Steel.
3½"×3½"×½" Angle Ears 4' long.
BACK BUCKSTAY 41'6" LONG.
Producer Gas Damper Port.
BACK PRODUCER
STAGE 23'2¾"
HEIGHT OF CHARGING
BRACING.
Waste Gas Damper Ports
Air Inlet
16"×6"×62lbs. H STEEL
END BUCKSTAYS 16"×10"×77lbs. H STEEL WITH FLANGE PLATE.
5"×¾" Flat Bar
6"×4"×½" Tee Steel.
GROUND FLOOR LINE.
CONCRETE FOUNDATION.
Expanded Metal Insertion.
Concrete Pier (Brick encased) down to solid Ground.
Concrete (Brick encased) Pier down to solid Ground.
Inches 12 9 6 3 0 1 2 3 4 5 6 7 Feet.

WALTER RALPH HERRING,
M.INST.C.E., *ENGINEER.*

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PHOTOGRAPH No. 70.—Gangways and push-plate conveyors supported upon the tops of the coal bunkers.

of T steel are also secured to the outer row of angle steels, with two rows of tube hand-rails passing through the web of same. The hydraulic cylinders for actuating the slides of the measuring chambers are bolted to the bottom of the hopper. The measuring chamber is also bolted to the bottom of the hopper.

To steady the low er end of the measuring chamber, and prevent the moving in and out of the slides from bringing shearing stress on the bolts suspending the chamber from the coal-hoppers above, a 10 inch by 5 inch H steel has been fixed, edge ways, the full length of the bench, and resting upon cast-iron brackets bolted to the buckstays (Plate No. 14), to the outer flange of which the lower portion of the measuring chamber is bolted.

The transverse joists formerly employed for supporting the hand lever frames and fulcrums were also made to carry the rails upon which the charging shoots traverse. The introduction of hydraulic power rendering unnecessary this addition to the structure at this particular point, other means had to be provided for supporting the outer rail. This has been accomplished by ntroducing a bent H steel bolted to the flange of the buckstay (Plate No. 14, fig. 1, and Photograph No. 63), and receiving some support from the outer flange of the longitudinal joist previously referred to as steadying the base of the measuring chambers. The rail upon which the charging shoots traverse consists of a 4 inch by 4 inch by § inch T steel resting upon angle cleats attached to the buckstay on the one side, and to the angle cleats attached to the lower ends of the curved member previously referred to on the other side.

A CHAMPION OF MUNICIPALISM.

THE speech of Sir Albert Rollit, M.P., the President of the Association of Municipal Corporations, when moving the adoption of the report at the recent annual meeting of the Association (which has now been published), was, as we have already remarked, by no means favourable to the contention that municipalities should undertake all that is proposed for them by the most ardent supporters of the "public ownership" movement; but at the same time it constituted a long defence of the principle that "both the State and the Municipalities may well do those things which the individuals cannot do for themselves, or which they can do better or cheaper than the individuals can do for themselves." He particularly mentions in this respect the supply of water, sanitation, parks, baths, libraries, and the like; and these are duties which most people readily concede come well within the province of local authorities. The objects here referred to, however (unless the words "and the like" are intended to cover a multitude of other works) are but a very small part of the ambitions of our really "Progressive" public bodies. They hardly come within the term "municipal trading," as generally understood; and it is with municipal trading proper that the critics to whom Sir Albert refers mainly concern themselves. This criticism, it is urged, is in most cases not based on practical knowledge of municipal life and action; and the suggestion is put forward that the critics should enter the councils and take part in the work before speaking their minds on the subject. This seems plausible enough at the first glance—but only at the first glance. The storm that has arisen is really over a question of principle; and therefore the ability to form a sound judgment on the matter is by no means confined to town councillors. It is, for instance, not necessary for a man to attain to the dignity of a mayor or alderman before it is possible for him to see that municipalities have no business to incur speculative risks with the ratepayers' money when there is ample private capital available for the purpose, or that it is unfair to force a man against his will to become a shareholder in what he may regard as a doubtful business when there are plenty of persons who would voluntarily invest their money in the undertaking. However, Sir Albert, after pouring forth the vials of his wrath on the critics, admits the justice of something at least of what they are contending for.

Dealing with the argument that municipal action restricts private enterprise, he admits that the latter is the very basis of the commercial system and success of the country, and that it ought to be encouraged, assisted, and protected in all possible proper ways, even to watching the interests of the very smallest traders. Parliament, he says, should reconcile by some means any undue competition, and, above all, any unseemly and wasteful conflict, between municipal and private action; and neither municipalities nor companies should be allowed simply to block the way by undertaking to make public works and never carrying them into action. If, however, privileges or monopolies were given by the community to private companies or syndicates, they ought to be adequately paid for and properly conditioned or controlled. Very well; but it must be distinctly understood that whatever sum has to be paid by capitalists for a "concession" will eventually come out of the pockets of the consumers. The supply of gas-stoves, electric fittings, and plumbing would, he says, appear to be best fitted for private enterprise; while general hospitals, abattoirs, and telephones, not only raise very debatable points of general public policy, but, in point of fact, most of them do not come within the range of practical municipal politics. "Moreover, no general rule could probably be prescribed in reference to these and other points; they must depend on local and other conditions and circumstances, including the amount of supply by private enterprise, and upon the judgment of Parliament in any particular case, according to the circumstances—their advocates assuming the onus of proving their necessity, the prudence of the proposals, and the approval of the locality." Why can no general rule be laid down? Why cannot the flights of municipal authorities be confined rigidly within matters affecting the public health and sanitation? We say "rigidly," for it is clear from Sir Albert's own speech that nothing but the most hard-and-fast boundaries will hold them in check. He refers with some pride to a debate in Parliament during which he defended the lifts up and down the cliffs provided by the Municipality at Hastings, "on the ground that they were really vertical roads or vertical bridges." We do not at all deny the usefulness of lifts at Hastings (which is a well-known resort for invalids); but we would venture to submit that if such arguments are to decide what public authorities should or should not undertake, the possibilities are simply endless.

Referring to the plain fact of the increasing municipal indebtedness (which he evidently regarded as a serious point, for he tried

his hardest to pour ridicule on those who draw attention to it), Sir Albert contended that the burden was only temporary, and was necessarily and constantly on the decrease as far as any borrowing for a particular work was concerned. Besides this, the debt was much more than represented by great reproductive public works, mostly profitable, though many of them were never expected or intended to be profitable. He then arrived at his "vindication," which was nothing less than the recently issued return of the Local Government Board relating to the reproductive undertakings carried on by municipal boroughs. The figures contained in this return were fully dealt with in the "JOURNAL" for Feb. 24 last (p. 467); and the use of them in the present case fulfils one half of the prophecy made in that article—namely, "that both partisans of municipal trading and those who disbelieve in the practice will probably have recourse to these tables to support their preconceived opinions." With regard to the net profit shown of £378,281 per annum for the four years ending March, 1902, shown, Sir Albert Rollit remarks: "It may be said that this is a small return on a capital of £121,000,000. But many of the works are unproductive (though absolutely necessary), and even sources of loss. Then many of them are for health and sanitation, in which a great indirect return is made, and some are not intended for profit at all. Moreover, the return showing the profit of £378,281 includes repayments of principal £1,260,000; and in calculating profits, of course you must strike this item out, because it is not properly chargeable to revenue. Indeed, it proportionately increases the value of the work as an asset." In like manner, he wishes to bring into account the £3,000,000 paid for interest, the result of which financial manipulation is to show a return of nearly 4 per cent. on the capital invested.

We fail entirely to appreciate that there is any value at all in this reasoning. The items referred to are fixed charges, and so should surely be deducted before anything is put aside as profit. It is perhaps unnecessary to add that by this method of calculation the "apparent (not real) loss on electricity" of £11,700 is turned into a credit balance of no less than £190,000, "a no mean achievement in the present state of electrical knowledge and science"—and arithmetic! However, the municipal traders (we beg Sir Albert's pardon, but we really cannot see why he should object so strongly to so suitable a name) may be left to make the most they can of the return in question; they may mislead each other, but will deceive no one else.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 99.)

THE improvement in the general tone of things prevailing on the Stock Exchange which we were able to report last week, has happily been continued; and it lasted unimpaired down to the closing of the Exchange on Thursday. This would be noteworthy in any circumstances. But it is more than usually remarkable to have a condition of buoyancy right up to a holiday break; and therefore some importance may fairly be attached to it. Although business was naturally of very restricted proportions, there was quite enough to operate a good rise. Consols and the gilt-edged division were taken freely for investment; and even the Foreign Market looked up, despite a disagreeable state of things in the near East, with its possibilities of kindling a European conflagration. The Money Market was very firm; and there was a brisk and steady demand for short loans, while discounts were rather a quiet business. In the Gas Market, transactions were assuming their holiday proportions; but still there was sufficient movement to indicate a disposition to participate in the general tendency to buoyancy and a recovery in prices. Changes in quotation, however, were few in number, and slight in degree. In Gaslight and Coke issues, the ordinary was but moderately dealt in. However, it began at once to make a better show. The opening figures were 81½, and after hanging-fire a little, it became stronger, and changed hands twice or thrice at 82¼, and the quotation had to be put up a point. A fair amount was done in the secured issues; but prices were only middling, and they did no more than just hold their places. Very quiet business was the sum-total in South Metropolitan; but the tendency looked decidedly like improving. In Commercials, some small parcels were done "special" to close an account, which very nearly put all the prices down. However, only the 4 per cent. receded a point. There were hardly any transactions at all in the Suburban and Provincial group. Alliance and Dublin old had an advance; but there was nothing marked in it. In the Continental Companies, there was no business, except in Imperial; and there was no change. Among the remoter Gas undertakings, River Plate had a little rise. The Water Companies had their usual quiet time; but there were a few changes in quotation; and these were irregular, as they have been of late.

The movements of the week were: On Tuesday, Alliance old rose ½. In Water, Lambeth 7½ per cent. fell 5. On Wednesday, Commercial old receded 1. In Water, Southwark ordinary gained 1, and ditto preference dropped 1. On Thursday, Gaslight ordinary rose 1, and River Plate ¼. In Water, Southwark gained 2.

PERSONAL.

The secretaryship of the Sutton Valence Gas Company, rendered vacant by the resignation of Mr. E. Long, has been conferred upon Mr. H. M. APPS.

At the meeting of the Institution of Civil Engineers last Tuesday, Mr. H. A. HUMPHREY, whose name will be remembered by our readers in connection with the Mond power gas scheme, was transferred from the class of associates to that of members.

Mr. J. LANCASTER, of Newcastle, has been appointed Assistant Water Engineer to the Plymouth Corporation, in succession to Mr. F. W. Lillicrap, who, as announced in the "JOURNAL" for Feb. 17, has obtained the position of Manager of the Devonport Corporation Water-Works.

The long connection of Mr. THOMAS LAYTON with the Redditch Gas Company, in the capacity of Engineer and Secretary, is to be severed by his resignation. Mr. Layton was, we believe, in the service of the owner of the works before they were acquired by the Company something like forty years ago.

Out of a large number of applicants, Mr. NICOL ALLAN, of Larne, has been selected as the successor of Mr. C. B. Tully as Manager and Secretary of the Sligo Gas Company. The circumstances under which the latter gentleman has relinquished the position, and come to London, were mentioned in the "JOURNAL" for the 17th ult.

In the "JOURNAL" for the 18th of November last it was announced that Mr. A. A. JOHNSTON had been entrusted with the management of the Ilford Gas-Works on Mr. Brown's removal to Nottingham. We learn that Mr. Johnston has now been appointed Engineer and Manager of the Company, and that Mr. J. CARTER MOON will be his Assistant.

OBITUARY.

The death took place last Saturday week, at his residence at Drayton, of Mr. SHELFORD BIDWELL, agent to the Drayton Manor Estates. Deceased, who took an active interest in local government questions, was the Chairman of the Tamworth Joint Water-Works Committee.

The death occurred in Carlisle, on Monday last week, after a few weeks' illness, of Mr. JOHN CORBETT. Deceased had been a member of the Corporation for 23 years, and was Mayor in 1893. He was for a time Chairman of the Geltsdale Water Committee (having had a large share in bringing the scheme before the city), but he resigned the position in July, 1901.

In the "Zeitschrift für angewandte Chemie" for the 3rd ult., Herr L. W. Winkler writes on the method of determining the hardness of water by means of potassium oleate solution, defending it against certain attacks made upon it by Grittner. He claims that his method is quite accurate enough for the ordinary examination of waters. The only case where it fails is that in which the water is very hard, and at the same time contains a large proportion of magnesia.

In a paper read before the New York Section of the Society of Chemical Industry, Dr. S. P. Sadler discussed the use of fireproofing materials as applied to wood. He stated that the satisfactory treatment of wood in this connection is much more difficult than that of textile fabrics, which can be thoroughly impregnated with the fireproofing solution by mere surface application. With wood, on the other hand, the solution has to be forced in at a very high pressure, if it is to reach the centre of large baulks of timber. It is, however, convenient to treat the timber in mass, and saw it up afterwards, notwithstanding the high pressure needed. Even with pressures of 130 lbs. per square inch, from 30 to 36 hours are necessary to properly impregnate soft wood timber 1 inch thick. Dr. Sadler considers the best fireproofing solution to be one of aluminium sulphate. Salts of ammonia have been used; but they are liable to cause efflorescence on the surface of the timber treated, and moreover tend, if anything, to make the timber more liable to decay.

At the beginning of the year, the management of the United States Steel Trust offered to their workmen on fair terms 25,000 shares of £10 nominal face value, carrying a preference dividend at the rate of 7 per cent. per annum, with other special future conditions to workmen shareholders of long standing. The total staff of 168,000 officials and men were divided into five classes, according to the amount of salary earned. The great majority of the men, however, came into the class where the salaries did not exceed £160 per annum, and where the men were to get shares equal in value to 20 per cent. of their annual wages. In this class, 14,260 men subscribed for 29,013 shares; and, consistent with the original intention, all the shares were allotted, although the number was in excess of the 25,000 originally set aside for this profit-sharing scheme. Altogether there were 27,633 applicants of all classes, and they subscribed for 51,125 shares; so it may be taken that the workers hold stock in the Company equal to half-a-million sterling at par, or upwards of £800,000 at the purchased value.

COMMUNICATED ARTICLE.

BLUE WATER GAS AT ILFORD—AND ELSEWHERE.

By A. G. GLASGOW, M.Inst.C.E.

As the "several gas engineers" for whose data I made way at your suggestion, have not yet profited by the immunity they required from my criticism, I shall accept your invitation to offer some further observations on the above question.

I.—I shall first deal with what you represent to me as "an exceedingly interesting statement by Mr. Sidney O. Stephenson, as to his experiences, tests, and actual costs at Tipton," which statement antedates my last letter.

My criticism will be purely arithmetical. Mr. Stephenson allots to his blue water gas one-fifth of his actual costs (last year) for purification, wear and tear, and exhausting, because 20 per cent. of his production is now blue water gas. He also adds 0·5d. per 1000 cubic feet of blue water gas to cover repairs to generating plant. This is more than fair—it is liberal; but his arithmetic is of a less generous and usual character. By taking one-fifth, not of his expenses, but of his costs per 1000 cubic feet, he charges to blue water gas one-fifth of one-fifth, or 4 per cent. instead of 20 per cent. of these expenses.

This arithmetical correction makes his blue water gas cost per 1000 cubic feet, by his basis of estimating—

Labour (one man at 4s. daily, and a boy at 10s. weekly)	0·68d.
Coke for generator, at 11s. per ton	2·20
Fuel for boiler	0·39
Purification	0·96
Wear and tear	2·85
Exhausting	0·20
Management, yard, and general expenses	0·93
	8·21d.

As repairs and maintenance of coal gas works will not average less than 3·5d. (instead of 2·35d.) per 1000 cubic feet, and as the whole of his coal gas plant—including retorts—is utilized by Mr. Stephenson for his blue water gas, in addition to his water gas generating plant, it is by no means certain that his estimate, as arithmetically corrected, is more than sufficient for average conditions.

Mr. Stephenson does not, therefore, justify a lower figure than 8d. per 1000 cubic feet, with the blue water gas passed through the coal gas retorts, as against 7½d. per 1000 cubic feet at Ilford, where the water gas is introduced at the hydraulic main, although coke is 5s. 8d. per ton cheaper at Tipton.

II.—Mr. Brown furnishes still another estimate of 5·11d. per 1000 cubic feet for the cost of blue water gas at Ilford, "based upon the lines laid down by Mr. Glasgow;" whereas in your issue of Feb. 17, he gave 8·7d. as the sum of "the figures Mr. Glasgow required." Yet my requirements have not changed in the meantime. To complete the range of costs now given for Ilford blue water gas, I may add Mr. Brown's own figure of 3·48d. and the "JOURNAL" statement: "The estimate of the cost of the water gas is 2¾d. per 1000 cubic feet—that is, charging coke to the plant at 15s. per ton, which is a high figure."

With reference to Mr. Brown's latest estimate, I would first point out some little misunderstandings as to the "lines laid down" by me. My definition was: "Wear and tear—being the whole wear and tear on the generating plant, and that proportion of wear and tear on the general works, from hydraulic main to storage holders inclusive, represented by the percentage of blue water gas introduced at the hydraulic main."

It will be noted that I did not say "whole works" as stated by Mr. Brown, but "general works," as general or common to the two systems of manufacture; and I specified what portion this included. If, presumably for value received, Mr. Brown elects to utilize this coal gas plant for his water gas manufacture, he cannot rightly charge the whole of its maintenance against the reduced volume of coal gas. To carry the point to a logical conclusion, suppose that no coal gas be made, and that the whole of the plant now used by the blue water gas be maintained for that gas alone. Is it contended that total repairs and maintenance will then be 0·5d. per 1000 cubic feet, and that management, office, yard, and incidental expenses will be *nil?*

With my maintenance figure of 1·8d. per 1000 cubic feet, for 25 per cent. of blue water gas, a charge of 4·07d. per 1000 cubic feet of the remaining coal gas would give the average maintenance expense of 3·5d. per 1000 cubic feet of gas made—being two-and-a-quarter times as much for the coal gas as for water gas. Under the circumstances at Ilford, this appears to me a not unreasonable allotment of these expenses.

Parenthetically, of course Mr. Brown knows that the admission of carburetted water gas to the hydraulic main is a very old plan. The objection is that unnecessarily expensive plant is used, and that the difficulties of condensation, ammonia extraction, purification, measurement, and supervision are increased.

The other little misunderstanding is implied in the first line of Mr. Brown's new estimate—namely: "Labour, coke, water, oil, as per test, *plus* 20 per cent., as per Mr. Glasgow's suggestion . . . 4·00d." My suggestion was to substitute his regular consumption of generator coke for the special figure obtained during his 18 hours' test. This increased only the generator coke. Mr. Brown accepts this suggestion, but deducts 37½ per cent. from the total charge for labour during the tests.

Mr. Brown further alters his previous item of purification; but in doing so he appears to adopt Mr. Stephenson's arithmetical process. His cost for purification per 1000 cubic feet of gas sold during the past half year was 0·62d., and he takes one-fourth of this cost per thousand for his cost per 1000 cubic feet of blue water gas.

I should, therefore, revise Mr. Brown's last estimate as follows:—

Labour, coke, oil, and water	4·00d.
Boiler fuel } (Personally, I should reverse these amounts) } Exhausting }	0·25 0·50
Purification, as per his accounts (disregarding leakage)	0·62
Wear and tear	1·80
Management, office, yard, and incidental expenses	1·00
	8·17d.
Less extra cost of test (which I should combine with management and yard expenses, making the latter 0·7d.)	0·30
	7·87d.

A reduction of 0·37d., instead of the customary margin of safety, leaves my previous figure of 7½d. as the cost of blue water gas under the conditions at Ilford.

Mr. Brown refers to his previous statement (and italics): "The *net cost of coal gas* at Ilford is not less than 2s. 2d. per 1000 cubic feet;" but his "instructive comparison" appears to deal only with his mixed coal and water gas. However, his extraordinary repairs partly explain his high cost of coal gas for the past half year; and his method of separating his water gas and coal gas accounts may do the rest.

I thoroughly appreciate Mr. Brown's generous invitation to witness his prospective tests; but I trust that I have shown no unwillingness to accept his former practical determinations. I think I have taken his actual results without question. Our differences lie in the items not subject to experimental determination, and in Mr. Brown's estimates and methods of accounting.

III.—You also call my notice to "a full statement of the costs of the working, since the time of installation, of the combined water gas and Peebles oil-gas plants at Cleethorpes;" and in your article on this subject you give the following "separate and total costs"—adding: "The figures include actual wages and an allowance for foreman's supervision."

Cost of Production of 2,600,000 *Cubic Feet of* 18-*Candle Gas.*

	£	s.	d.
Oil—5694 gallons, at 2¾d.	62	5	7
Coke for water-gas generator—37 tons 14 cwt., at 10s. per ton	18	17	0
Coke (fuel for oil retorts)—15 tons 12 cwt., at 10s. per ton	7	16	0
Wages—5s. per 100,000 cubic feet	6	10	0
Purification—0·125d. per 1000 cubic feet	1	7	1
	96	15	8
Less coke residuum—5 tons 12 cwt., at 10s. per ton	2	16	0
	93	19	8

Equal to 8·67d. per 1000 cubic feet.

In a foot-note, the "Ed. J.G.L." suggests that these costs are "unduly high."

Again, as at Ilford, I have to point out that this is not the "total cost" of the gas. The following items are altogether omitted: (*a*) wear and tear; (*b*) boilers, blowing, pumping, and exhausting; and (*c*) management, yard, and general expenses. Also the charge for wages and foreman's supervision (5s. total per eight-hours shift—or more) is obviously insufficient for the operation of this composite plant.

But it is not necessary to labour this "total cost," for there are sufficient data on the manufacture of Peebles oil gas to reach an independent conclusion. The Cleethorpes carburetted water gas consists, roundly, of 20 per cent. of oil gas and 80 per cent. of blue water gas. The complete cost of finished Peebles gas, with oil and coke at Cleethorpes prices, will closely approximate 4s. per 1000 cubic feet. With blue water gas at (say) 7d. per 1000 cubic feet, we have—

200 cubic feet at 4s. per 1000	9·60d.
800 ,, ,, ,, 7d. ,,	5·60
1000 cubic feet of mixed gas	15·20d.

Approximately 15d., instead of your "total cost" of 8·67d., per 1000 cubic feet.

It may be worth remarking that the thermal conclusions in my first statement are corroborated by the coke results at Cleethorpes—viz., 46 lbs. (excluding boiler) per 1000 cubic feet of carburetted water gas made—being 32½ lbs. for the generator, and 13½ lbs. for the oil-retorts. The Lowe generator does the whole of this work; and the returns before me from 25 installations show but one case where the Lowe fuel consumption, during the various periods covered, equalled the Cleethorpes generator figure. This would mean a clear saving of the coke used for the oil-retorts, which represents at Cleethorpes 41½ per cent. of the

generator consumption. Allowing for inequalities in comparison, we may safely say that the Cleethorpes type of installation consumes on the average one-third more coke than Lowe plant making the same gas. This additional fuel, together with increased repairs, labour, expense of starting and standing, and generally reduced availability, sufficiently account for the complete supersession of the original "generator-retort" system by the Lowe process.

IV.—Having now, Sir, toiled through your special references, I think that I have earned the luxury of a tilt at your editorial windmill.

For the clearer understanding of our relative positions, I will revert to my first articles bearing on this subject, under the title of "Cheap Gas and Flame-Luminosity." I warned you last year that, in lending support to "cheap gas by dilution," you were encouraging a heresy; and I illustrated my arguments by indicating the net commercial loss due to the admixture of blue or lightly-carburetted water gas with coal gas. Ignorant that "dilute" has a qualitative as well as a quantitative significance, you eschewed argument and seized upon that quibble to escape what you had previously described as a "momentous issue;" while deploring my "boggling," "blunder," &c., and never omitting the "innuendo" that I was touting for my personal trade interests. Speaking for Mr. Jones and yourself, you categorically declared that "the 'dilution' of coal gas is rightly classified as a heresy." Foreseeing what was coming, I replied that your declaration sufficiently established my case, as far as you were concerned; and a few days later Mr. Jones read his paper advocating both quantitative and qualitative dilution, by the admixture with coal gas of double its bulk of lightly-carburetted water gas.

But a quick-change artist apparently purveys your editorial policy. Scarcely six months after your declaration of the heresy of dilution, you published your fulsome description of diluting at Ilford.

Your editorial methods prevent any conclusion being reached through that medium; but the persistent and deliberate spread of misrepresentation by the practical promoters of the blue water gas heresy provided a direct and effective channel for such influence as I possess. I, therefore, in a personal and unequivocal statement, grappled with the present practical source of this heresy—with what result your readers may judge, although you have done your best to prejudice their opinions. To denounce the personal nature of such a statement is sufficiently absurd. But you gravely supplement this by calling the preceding studies in elementary arithmetic and accounting, "pursuing the debate on the most profitable lines;" whereas my broad exposition of the *malâ fides* of the active promoters of the heresy, you describe as making "the 'JOURNAL,' under the guise of an effort to harmonize technical disagreement, the wrangling ground of trade rivals."

However distasteful, it may be nevertheless advisable to notice your oft-recurring "innuendoes" regarding my trade connection. To understand my position, you must swallow the unpalatable fact that I countenance, not the use, but only the advantageous use of water gas; and that no one will obtain, through my efforts, what I would not use myself. For instance, Mr. Jones was, previous to our controversy, one of my best clients; and his paper advocated the greatly extended use of carburetted water gas. Nothing could have been more conducive to my immediate trade interests; and, considering the numerous competing constructors of carburetted water gas plant, it is palpably illogical to insinuate that I estranged him—and am now alienating others, including yourself—in order to further my own material interests. Furthermore, as modern Lowe plant has the unique advantage of making blue water gas at least as cheaply as any simple blue gas generator in existence, while not definitely committing its possessor to that heresy, it must be evident to an unbiassed perception that, had I chosen to do so, I might have advanced my material interests by pandering to blue gas manufacture, while affording a safe carburetted string to the bow.

In a previous reference to the heresy of blue gas dilution, as modified by benzolizing, I described the conditions under which an apparently satisfactory case might be made, as opportunism killing the goose that lays the golden egg. Proverbial opportunism is surely "of the worst character." As your idols were shattered, you gradually worked this up into "obscure suggestions of dishonourable action on the part of users of benzol enrichment." I cannot, of course, accept such melodramatic play to the gallery as a sensible interpretation of my argument. But, apart from this, let us see how your "unctuous rectitude" bears analysis.

A gas undertaking is presumably under moral obligation to supply its prescribed quality of gas to its consumers. Do you hold that common coal gas of (say) 14-candle power, benzolized to 16-candle power, at the works or at neighbouring testing-stations, reaches the general consumers at that quality? If so, you may advantageously study, among others, Sir George Livesey's statements regarding vapour enrichment ("The Enrichment of Coal Gas, 1900"): "Reliable evidence as to its want of efficiency is furnished by the fortnight's experiment in 1894, when all the South Metropolitan gas was sent out unenriched, and the succeeding fortnight when it was enriched with spirit as usual. The tests by the portable photometer were practically the same in both cases. Therefore, if this complete practical experiment gave, as is believed, reliable results, the conclusion is inevitable that enrichment by spirit vapour is useless and simply a waste of the consumers' money."

Since vapour enrichment, as practised, is admitted to be a means of satisfying official testing, rather than of benefiting the consumer, what becomes of your fireworks? And what of the wisdom of those who would extend methods, proven ineffective for the slight enrichment of coal gas, to the enrichment of non-luminous water gas?

To pursue the point, gas of a given quality has a recognized value for heat and power purposes. Consumers, before now, have invested in furnaces and gas-engines, and scrapped steam-plant, on narrow margins of calorific saving; and Mr. Stephenson admits that with 37 per cent. of water gas, *plus* heavy benzolizing, his gas loses 11 per cent. in calorific value. Yet you call this "exceedingly interesting," and write yourself approvingly of 40 per cent. admixture of blue water gas at Ilford, with no benzolizing. What price "unctuous rectitude?"

Another curious bid to the gallery, made with striking unanimity by Mr. Brown, Mr. Dellwik, and yourself, is to the effect that I belittle the intelligence of your readers in supposing they would accept your figures. I do them no such injustice. I have every confidence in the intelligence of your general readers, or I should not now appeal to them. But it is apparent that you are throwing unnecessary burdens upon them. Having yourself advanced the incredible estimate that "the cost of the water gas is 2¾d. per 1000 cubic feet," you now assure me that "the men most concerned are not likely to be lured into the 'general acceptance' of any bare statement that 'plain water gas costs only 3½d. or less,' without exercising on their own account their knowledge and trained intelligence." You characteristically fail to grasp that the intelligence in question is not that of your readers; and, even in this eleventh hour, you endorse as "actual costs," "full statement of the cost of working," "separate and total costs," statements violating elementary arithmetic and accounts. Yet we are assured that "any person of average intelligence" can "gauge the actual holder cost."

Finally, in charitable return for imputations against me—framed neither with art nor propriety, and having no foundation in substance or in fact—I again warn you that to "cheapen" gas, by increasing the cost of light, heat, and power to the consumer, is indeed a non-luminous policy.

TECHNICAL RECORD.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Half-Yearly Meeting at Penicuik.

The Eighty-fourth Half-Yearly Meeting of the above-named Association was held in the Royal Hotel, Penicuik, last Thursday There was a good attendance. Mr. A. BELL, sen., of Dalkeith, occupied the chair, in the unavoidable absence of the President, Mr. L. Bell, of Innerleithen.

The CHAIRMAN explained that Mr. Laurence Bell, his son, as they knew, was changing his profession. Only that morning he had had a communication from his son saying that he could not be present; and while he himself was so ill that he should have been in bed, he had come on. They were in rather a peculiar position, having no Presidential Address; but he might explain to the Directors of the Penicuik Gas Company (who were present) that theirs was not a formal gathering, but rather an informal one. They had met for the purpose of comparing notes one with the other, and having a general talk; so that they were not so dependent upon formal papers. They would therefore have a talk upon any subject which might be introduced.

Mr. J. RUSSELL, one of the Directors of the Gas Company, extended a welcome, on behalf of the Directors, to the Association. He was sorry that their Chairman was not present to do so; but he had very much pleasure in welcoming them to their district.

Mr. W. EWING (Greenock), having been called upon by the Chairman, said he was taken by surprise in being asked to lead off; but he thought that one of the important questions for them at the present time was the cost per ton of coal carbonized by hand labour. In his opinion, the cost of hand labour should include the cost of steam and stokers' wages—the complete handling and breaking of the coal from the time it was received in the works until it was laid down as coke in the yard. In making comparisons with mechanical stoking, he thought there had been a great many misleading statements made regarding the cost per ton of coal carbonized. A standard should be formed, so that each manager could make a complete comparison, showing how he stood as regarded others in different parts of the country. He had often heard it stated that coal was carbonized at (say) 1s. 4d. or 1s. 6d. per ton; but, upon making inquiries, he had found it to turn out at about 3s. per ton. If anyone there could make a comparison, on exact lines, between machine stoking (which should include all the expense of extra capital, interest, and depreciation) and hand stoking, he would be pleased to hear him. He was greatly interested in the matter; and he felt that it had been often incorrectly stated. His experience

had always been this—that in the retort-house, if they paid a man a fair day's wage, and trusted him, they secured a fair day's work. In all his experience, he had not yet seen what might be called a fair comparison between hand labour and machine labour. He had always been an advocate of hand labour, with simple generator retort-settings, because he had never yet found anything more efficient in a gas-works than the proverbial man with a barrow and shovel. With these they would find, in not a few gas-works in Scotland, that coal could be carbonized at 1s. 8d. per ton, all expenses included. He had yet to see machine stoking which would come within long strides of this. Give them (say) 100 retorts, it was quite possible—in fact, he himself had done it—to erect them with ironwork and every detail complete, for about £1500. With these, they would get the maximum efficiency in make of gas, and would be able to sell 10 cwt. of coke per ton of coal carbonized, and carbonize easily at from 1s. 6d. to 1s. 8d. per ton of coal. Gas managers were often led away with wrong ideas as to machine stoking and fancy retorts. His opinion was that the standard was the generator setting, because it was cheap and efficient; and he thought the time had come when they should knock on the head the many erroneous statements which had been made regarding the cost of carbonizing per ton of coal. He said that it could be done under ordinary conditions in any retort-house in a works making 40 or 50 million cubic feet of gas, at 1s. 6d. per ton of coal, and pay fair wages to the stokers.

The CHAIRMAN pointed out that, though this was a very important subject indeed, and very interesting to all, it was not a burning question with them in the Waverley Association, the members of which were in charge of small works, and none of whom had had experience as yet—and had little prospect of ever having experience—of machinery in their works. He thought a more suitable topic for them would be that of benzol enrichment; and he knew there were gentlemen present who could give them information upon this subject.

Mr. P. BLAIR (Haddington) thought that most of the managers in the Association did not make any difference between their carbonization, purification, and distribution costs. Most of them attended to the distribution themselves; and when they were changing a purifier, they simply took a man from the retort-house. So far as he was aware, in a small works they operated as cheaply as in some of the larger ones; but there was a long period of the year during which they were not working at full capacity, and so a comparison could not be made at all times. He had adopted benzol enrichment; and he found that it worked pretty well. At the present time, he was passing the whole of his gas through the carburettor. After about twelve months' experience, he found that he was able to enrich, on an average, about 3500 cubic feet of gas by 5 candles—raising it from 20 to 25 candles—with a gallon of 90 per cent. benzol. There were times when he could enrich as much as 5000 cubic feet with a gallon; but this was when their friends, the coalowners, gave him good stuff. When he received only dross, he could not get higher than 3500 cubic feet. The quantity also depended a great deal upon the temperature. It required more benzol when the temperature went below freezing-point. He found benzol to be cheaper than cannel; but should first-class cannel come down in price, he had no doubt it might be as cheap to go back to it for enrichment. Of course, more coke was made when splint was used. But if the price of coal came down, there would be no market for coke; and it simply came to this—that they would just have to take the price down, and it would be better to make less coke and keep the old price up.

The HON. SECRETARY (Mr. W. Young, of Penicuik) said that twelve months ago he started a small-sized Maxim carburettor at the Penicuik Gas-Works. It cost him something like £90 to put it down. Before this, he had been using one-third high-class cannel against an ordinary splint; but now he employed no first-class cannel at all. With an ordinary splint, giving an illuminating power of about 19 candles, he found that by using 1 per cent. of shale and 3 gallons of benzol per ton of coal, he was able to supply gas of 25·5-candle power. He would not like now to go back to the old system of using high-class cannel; and he would strongly recommend other managers to go in for the process of enrichment by benzol. Before they started the carburettor, it was costing them nearly 2s. per 1000 cubic feet to produce gas; now he was able to produce it at about 1s. 6d. A year ago, he went in for purification by oxide of iron alone. He had four purifiers, 10 feet square by 4 feet deep; and during the whole year he had never emptied one of them. It had not cost him £2 for lime since—in fact, he was never going to use lime again.

Mr. BLAIR: Do you test for carbonic acid?

Mr. YOUNG said he did not. He did not think carbonic acid did much harm—anyway he heard no complaints about it. Purification by oxide was a great saving of labour. In winter, he used to empty a purifier every week. Last winter he did not have to take out one; but he expected that he would have to clean one out this summer.

Mr. BLAIR said he went in for purification by oxide of iron last year; but he tested for carbonic acid. He adopted the same method of working as Mr. Lighbody, of Renfrew—that was, he worked the purifiers half and half, or rather 60 per cent. of lime to 40 per cent. of oxide. He took out all the carbonic acid. He found there was not much saving of labour, as he had to change some of his purifiers as he did before.

The CHAIRMAN said he had not gone in for benzol enrichment. He would like very much to hear about the saving it effected. The works both at Haddington and Penicuik were small; and if benzol enrichment could be applied profitably there, he did not see why more of it should not be used. His own idea was that in very cold weather it would not travel well. They might have to go in for the use of oxide of iron yet, because the day was come when farmers did not care for the lime they had to sell. He had to give his lime away. Formerly he got 2s. 6d. per load for it; but now farmers would tell him where he could put it—five miles away—if he liked to cart it. Certainly he would take out all the carbonic acid, because its action on gas was very deleterious indeed. How, he asked, did Mr. Blair work the purification, half and half?

Mr. BLAIR explained that the trays were oxide and lime time about in the first three purifiers, and the fourth purifier was all lime. He placed sacking to keep the two materials separate. He carburetted the gas between the station meter and the holder.

Mr. T. WILSON (Coatbridge) presumed that his experience in enriching by benzol, and also in purification, had been greater than that of anybody there. It might interest them if he were to tell them what they did at Coatbridge some years ago. They used to enrich by shale alone, using from 6000 to 8000 tons of shale a year. The process of enriching by benzol was put before him, and he saw that it was going to be a very considerable saving to him. The saving it had been, taking credit for everything—the extra price he received per ton of coke, and the cheapness of the enrichment—was going to be something like £3000 a year. The benzol process had carried out all that was promised of it. He had been able to reduce the price of coal very considerably. The average price he was paying for coal to-day was from 6s. 9d. to 7s. per ton. It was all dross—very small coal—that he used; and his reason for employing it was that he got a first-class smithy char from it, for which he obtained 11s. per ton. Last year, his average price for coal was 6s. 9d. per ton; and he sold coke at the price of 10s. per ton of coal carbonized. He got about as much for the coke as the coal cost; and he had the tar and the liquor over and above. This enrichment was applied as the gas was going into the town. In his opinion, it would be a wrong idea to enrich into the holder, especially in cold weather. He had had no difficulty as to permanency. The standard at Coatbridge was 20 candles; he gave 22½ candles. He could regulate it to a nicety; and he had not taken 40 gallons of benzol out of the first trap. The main running into the town was a 24-inch one; and there was a trap upon it which collected about half-a-mile of the main. If they did get benzol in the trap, it was due to the carelessness of the foreman in putting in more than the gas was able to carry. He was surprised that the gas managers of Scotland had not all adopted benzol enrichment, because of the saving it effected. If they took shale at 10s. to 12s. per ton, there was no doubt they would get the enrichment. They would, however, have to pay for the trimming of the coal, and the carting away of the refuse; and when they bought dross or nuts, they had 10 cwt. of coke, as compared with what they would have to pay for carting away the rubbish if they used shale. He had just bought benzol at 7½d. per gallon. But he had discovered that it was not all benzol which was being sold; there was a lighter hydrocarbon which was being sold for benzol, the gas from which did not carry so well. But benzol became part and parcel of the gas, and it carried well. He had the feeling that their friend Mr. Ewing should not be "closured," although the subject he had raised was far more interesting to the managers of large gas-works than to them. He (Mr. Wilson) would probably have had machinery in his works; but he had made numerous inquiries on the subject—had, in fact, lost sleep over it—and he was convinced that he could get no machinery that would carbonize cheaper than hand labour. He had not been able to reduce his carbonizing wages below 1s. 8d. per ton of coal used. With small coal, there was no breaking required, and that would perhaps take 3d. per ton off the cost of carbonizing; but there were no two gas-works alike. Mr. Ewing's greatest experience had been in the centre of Scotland's mineral field. He himself was supposed to be in the centre of the mineral field, but he was not, as he had 9d. per ton to pay for carriage. He presumed that Mr. Blair extracted all the carbonic acid out of the gas by the 60 per cent. of lime. He had used lime only, but had never been able to take all the carbonic acid out of the gas. If they passed the gas through lime alone, it became carbonate of lime, which had not an affinity for carbonic acid. But during the last three years, he had never used a pound of lime; and he got as much for the spent oxide as he had paid for it. Enrichment by benzol was so cheap that the carbonic acid was never a trouble. He enriched coal gas of from 16 to 18 candles to 22½ candles, at a cost of 1½d. to 2d. per 1000 cubic feet—about a gallon-and-a-half of benzol to the ton of coal. As to the high yields which some obtained, he had been a gas manager for 32 years, and he was well pleased if he got 8500 cubic feet per ton of coal. He had always gone on the lines of buying a cheap coal, and not distilling at too high a temperature. He and the late Mr. John M'Crae, of Dundee, had long discussions about that; and he thought that Mr. M'Crae was latterly getting converted to his idea. When they distilled at a high temperature, they did great damage to the ovens. He did not adduce the figures he had given to show that he was doing better than his neighbours, because he was not; he was situated in a part of the country that suited their results, and he did not think there were any in that meeting who were so

well situated. The average cost of making gas, excluding distribution, taxes, and steam, was 1s. 3·26d. per 1000 cubic feet last year. He begged his Directors to reduce the price to 2s. 1d.; but they asked it to be allowed to stand at 2s. 4d. till June. It was, however, their intention to sell it at 2s. 1d.

Mr. W. VICKERS (Edinburgh) asked what was the durability of the gas he sold at 2s. 4d.

Mr. WILSON replied that it was 44 minutes for his 22½-candle gas, and there was no deposit.

Mr. BLAIR: Do you enrich for the whole 24 hours?

Mr. WILSON said they did. They were obliged to do so, because the Town Council came and tested their gas, and found it only 16 candles. They now enriched during the whole day.

The CHAIRMAN said the members were very much indebted to Mr. Wilson for the information he had given them; but he pointed out that it would cost him about 6s. 4d. for the coal Mr. Wilson used.

Mr. WILSON replied that he was not obliged to use the same coal, as he could employ a splint raised in the district. He was consulted as to the Penicuik Gas Company's works, and he was delighted to hear of Mr. Young's results. He might point out to them that dross would not stack. If it were stacked, it would oxidize; it must be used at once.

Mr. H. O'CONNOR (Edinburgh) said his experience as to benzol had been from the point of view of the maker of apparatus; but one or two matters had been raised upon which he might say something. He thought a good deal of the difference among gas managers as to oxide of iron was that they were using it in various ways. His experience was that it was better to keep the oxide by itself, in front of the lime—using it to remove the sulphuretted hydrogen, and the lime to take out the carbonic acid. In this way they got the benefit of both. They all knew that if lime were used to remove both sulphuretted hydrogen and carbonic acid, it would first of all take up the former, and afterwards the latter. If they took out the sulphuretted hydrogen in the first instance by oxide, they had the lime left free to take up the carbonic acid only; and in this way they derived the greatest benefit from the oxide. Wherever they had the two in one purifier, they were always liable to get a certain quantity of lime mixed with the oxide. In this case, when they came to sell the oxide, after it had been charged with 60 per cent. of sulphur, they would have some difficulty in doing so; but, if it were free from lime, they would get not only as much as they paid for it, but in some cases considerably more. He knew several works in Scotland where the arrangement was made that they were paid 1s. 2d. per ton for every ton of coal they put through the oxide of iron. It was not, of course, the sulphur that was valuable, but the cyanogen contained in the oxide when it was used solely for the removal of the sulphuretted hydrogen. He entirely agreed with Mr. Ewing in his preference for a simple generator setting to the more elaborate regenerator settings. He had had experience in both small and large works, and in the latter he had had regenerators of the most elaborate as well as of a comparatively simple kind. Where they had a stage-floor house and plenty of room, and—and it was a very large "and"—a chemist whose business it was to test the gases in the various parts of an elaborate setting, those works could be carried on far more economically than if they had a generator setting. But in works such as most of the managers present had to deal with, they could not afford to employ a trained chemist for the purpose named, and consequently something much more simple, which could be regulated by the eye rather than by scientific methods, was more durable, because it would work at its proper heats throughout. It was not so much high heats which damaged a setting as the changing of the heats—high one day and low the next; and with regenerator settings it was very difficult to keep the heats regular. Consequently, the arches and every part of the setting got broken up, and rendered it practically done for, in very much shorter time than in the case of a generator setting, where they had a comparatively short range of flues, and did not heat the primary air.

Mr. WILSON remarked that Mr. Ewing had had experience of both generator and regenerator settings, and might give them his opinion as to which was best. He himself had not had experience with regenerators; but he had had generator settings for ten years—a most inexpensive setting, to begin with, the whole bench, ironwork and all, only costing £13 per mouthpiece, whereas, he believed, some regenerator settings cost £42 and more.

Mr. EWING thought the discussion was a very practical one. It was practical men who were wanted in their profession. He had no doubt there was an array of them present, who would hold high positions later on. In his opinion, the man in a gas-works who had had a good hard training was the man who made the biggest profit for his company or corporation. Mr. Wilson had given them a very interesting statement with regard to enrichment by benzol. His own first experience with benzol was in 1894, when he took out a patent for enrichment by this means at the meter. It was most successful; but they did not want that kind of thing now-a-days, when they had incandescent burners, because a 15-candle gas was all that was required. It might be remembered that on Dec. 25, 1894, they had the start of a most severe winter; and he gave up benzol about a month after that, because he found the frost had a very bad effect indeed upon enrichment. If they wanted to enrich more than 2 or 3 candles, it was next to impossible for the gas to carry it during severe weather. He had introduced a Maxim carburettor at Greenock; and he was very hopeful, from the experience he had already had of it, that they would make a very large saving during the next year or so. He used a coking coal, and was able to get a very fair price indeed for his coke; but, owing to the disturbed condition of the works at the present time, he could not get the best results, either in the enrichment by benzol or in the carbonization of his coal. His retort-house had been in the hands of contractors for three years. During the past winter, the coal was stored outside. It came in trucks, with many a time the water running out of them; but in spite of all his difficulties, he had had results as good, in proportion to the difficulties, as he had at Hamilton. Greenock was a place where a great deal of good work had been done. He had there followed one of the leaders in the profession, who, through failing health, unfortunately had to relinquish his appointment, after 36 years' valuable service to the Corporation. He had had considerable experience of both generator and regenerator settings. About fifteen years ago, he had the privilege of watching a series of experiments carried out by that veteran Gas Engineer, Mr. George Anderson; and at that time he came to the conclusion, from the interesting results that were obtained, that a generator setting was the most suitable setting either for small or large works. Mr. Anderson, he thought, had experimented with every form of retort-setting except inclines; and he had spared no expense in getting at the bottom of everything he thought was new or interesting, or of value to the gas profession generally. He was indebted to Mr. Anderson for many of the valuable hints he had got regarding generator settings. Mr. Wilson's figure of £13 per mouthpiece was a most moderate one, when compared with £100 per mouthpiece, which had been paid for regenerator settings, *plus* the necessary machinery used in large gas-works. In all his experience, he had never yet seen a regenerator setting which could be compared with a good generator setting, properly handled, by a man with a barrow and shovel. They obtained 10,000 cubic feet of gas from it, using a suitable coal; and they could sell 10 cwt. of coke per ton of coal. He had often obtained 11 cwt. of coke per ton of coking coal, with generator settings. It was now fifteen years since he had the privilege of working where oxide of iron was wholly used for purification. The illuminating power was a secondary consideration there. It sometimes was 10 candles, oftener 8 candles. No doubt, this was largely due to carbonic acid present in the gas. They often found in English coal a larger percentage of carbonic acid than in Scotch coal. An important factor in the purchasing of coal for the manufacture of gas was the carbonic acid in the coal. It could be easily ascertained; and if they were enriching by benzol, they could purify entirely by oxide of iron. In his present works, he purified by means of oxide, and finished off with lime. During the past winter, he had had difficulty on account of the revivifying having mostly to be done outside, where, during the wet season, it was impossible to accomplish what he would have liked; and there was considerable caking in the purifiers, because the temperature of the gas was raised—in some instances as much as 40° or 50°—in passing through the purifiers, owing to the smallness of their capacity. Nobody had told him the cost of carbonizing per ton of coal in a works making about 50 million cubic feet. He considered that that was a matter which should be standardized.

Mr. WILSON: You cannot standardize it, because no two works are alike.

The CHAIRMAN expressed his pleasure at their having had such an interesting discussion. Some points had been made which he thought might be taken as a standard, and worked up to. They had heard a good deal about benzol; and he would like the representatives of the coalmasters who were present to take note that they would require to shut down unless they could reduce the price of coal to a certain figure.

Mr. H. RUTHERFORD (Aberlady) proposed that Mr. P. Blair, of Haddington, be elected President of the Association.

Mr. J. M'LAREN (Duns) seconded the motion, which was agreed to.

On the motion of the CHAIRMAN, seconded by Mr. BLAIR, Mr. W. Young was re-elected Hon. Secretary.

Mr. M'LAREN said that they were in the very unusual position that their President was not present to receive the medal which they were in the habit of giving. He had much pleasure in presenting the President's medal to the son; but he had also pleasure in handing it to the father to give to the son.

The CHAIRMAN again expressed his regret that his son was not there to receive the medal; and he was sure his son was as sorry as he was. But he would have pleasure in handing the medal to him, and was certain that it would be highly prized.

Mr. J. GEMMELL (Melrose) moved a vote of thanks to Mr. Bell for presiding.

The members and friends dined together under the presidency of Mr. BLAIR. In the course of a very short toast list, Provost WILSON, of Penicuik, proposed "The Waverley Association of Gas Managers."

After dinner, the company, through the kindness of the Directors of the Penicuik Gas Company, enjoyed a drive to the historic

chapel at Roslin. On the way, a halt was made at the gas-works, which are situated about a mile from the town. Originally the works were in the town; but they were purchased by the Messrs. Cowan, the proprietors of the famous Valleyfield Paper Works. The Directors, with forethought, placed the gas-works where they now are—in a position where they are well served by road, rail, and water, and in close proximity to coal pits, from which excellent gas-making coal is obtained. The works have been open for twenty-two years. They have been taken such care of that they appear as if they were all but new. The consumption of gas is 10 million cubic feet per annum; but the foresight of the Board was such, at the time of their inception, that though the business is growing steadily, the works are still capable of dealing with considerably more gas than is at present required. The retort-house contains a single bench of retorts, fired upon a generator system devised by Mr. H. O'Connor, of Edinburgh. The bench stands against the wall, on the other side of which, in the purifier-house, are the horizontal condensers, which, deriving heat from the retorts, deal with the gas slowly. The purifier-house is a lean-to of the retort-house. There is a neatly-kept house at the end of the main building, in which are the exhauster, driven by steam, the station meter, governor, and the pump for working the tower scrubber outside. The Maxim carburettor is situated in a new wooden erection close by. The works are most regularly arranged, and their condition, as to the care of the plant, the general cleanliness, and the beautification even of the surroundings, is such as called forth the admiration of all. Mr. Young, the Manager, was warmly congratulated upon these points—as, indeed, he deserved to be. At Roslin, most of the visitors renewed their acquaintance with the unique piece of ecclesiastical architecture that is famous the world over. The party broke up at Roslin—nearly all leaving by a train which reached Edinburgh as the shades of a beautiful spring evening were closing in.

North of England Association.—We learn from the Hon. Secretary of the Association (Mr. Herbert Lees, of Hexham) that the half-yearly meeting will be held in the County Hotel, Newcastle-upon-Tyne, on the 25th inst., under the presidency of Mr. A. B. Walker. The business will comprise the election of office-bearers for the year, and the reading of two papers—one by Mr. James Whyte, of Seaham Harbour, entitled "Is the *Zigzag* Flue Necessary for Heating Secondary Air?" and the other by Mr. E. E. J. Anderson, of Middleton, on "The Future of Gas." The members afterwards dine together.

Graham's Hot-Coke Conveyor.—In the early part of this year, Mr. Maurice Graham (of Messrs. Graham, Morton, and Co., Limited, of Leeds) patented a new form of coke-conveyor; and in the "JOURNAL" for March 31, we gave an extract from the patent specification. Since then the firm have erected an example of this new design at their works, in order that gas engineers and managers who desire to do so may see it working with hot coke. The novel features of the conveyor are: The coke is carried on heavy steel perforated grids (of the boiler fire-bar section), and is quenched on them; the surplus water draining below. The advantage of this is that the water is separated from the coke immediately after quenching; and therefore the coke upon being conveyed to the coke yard or coke storage bunkers is dried in transit. Another novel feature is the complete extraction of the steam and fumes by means of a large fan, in order to avoid nuisance in the retort-house, and the complaint of stokers of the excessive steam and heat evolved during the retort drawing operations.

Engineering Standards.—Sir Francis Hopwood, the Permanent Secretary to the Board of Trade, has written to Mr. Leslie S. Robertson, the Secretary of the Engineering Standards Committee, whose labours were referred to in the "JOURNAL" for the 10th ult. (p. 619), stating that the Treasury have included in the Board of Trade estimates for the current financial year the sum of £3000, as a contribution towards the funds of the Committee for the year. He pointed out that the actual expenditure under the vote would have to be authorized by the Department on the recommendation of a Committee which should be specially appointed for the purpose by the Institution of Civil Engineers, and which should contain one *ex officio* representative of the Board of Trade. The Committee have communicated the letter to the Council of the Institution, and they have nominated a Committee. The Committee put on record "their appreciation of the Government's desire to assist the trade of the country by placing at their disposal not only financial support, but also the valuable services of representatives of the various Government Departments." Sir Francis Hopwood, in the course of his letter, said: "In conveying to the Engineering Standards Committee the decision come to by the Treasury as to the grant to be made, the Board of Trade desire me to state that they regard the work undertaken by the Committee—including as it does the preparation of standard specifications for engineering works, and of standard sections of rolled iron and steel, together with the standardization of parts of locomotives and electrical appliances—as tending to reduce both the cost of production and the time occupied in completion, and as being of the highest value to the country at large."

QUESTIONS OF TEMPERATURE AND THE MIXING OF GASES.

An excellent feature of the meetings of American Gas Associations—and one which appears to increase in value as time goes on—is the "Question Box," by means of which members, or the executive, are able to ask for information on any points regarding which there may be a variety of views held, or which they think will afford good scope for an interchange of opinions. The result is usually an interesting discussion on the various matters so brought forward; for whatever may be the nature of the query, some of the members are pretty sure to be able to throw light upon it. In this way a man, while perhaps feeling himself quite unequal to the task of preparing a paper which would add materially to the knowledge of the majority of his fellow members, might, by suggesting, or himself putting, a well-chosen question, be the means of extracting information of inestimable value to others as well as to himself. We are moved to this reflection by a perusal of the discussion which took place over the contents of the Question Box at the recent annual meeting of the New England Association of Gas Engineers, during which several matters of a most interesting nature were dealt with in a manner which could not fail to be gratifying to the originator or originators of the queries.

One of the questions was as follows: "What are the proper temperatures at which to operate the various parts of a coal-gas plant?" In reply to this, Mr. S. J. Fowler, of the Charlestown (Mass.) Gas Works, remarked that at his works the machinery between the foul main and the purifying boxes consisted of the exhausters, a Walker tar-extractor, a condenser, and a "Standard" scrubber. The gas entered the exhausters ordinarily at a temperature of about 100°—between 94° and 104°. He did not test the temperature again until the gas came out of the condenser, at which place it was from 76° to 84°. It remained then in that small room, and was carried underground to the purifying-house, the cellar of which was kept very warm—a single steam-pipe running round under each of the four boxes. The exact temperature of the gas here, he had no means of knowing; but it was not ordinarily cooled below 75° and 80° until it arrived in the holders. No attempt whatever was made to keep the first box in the series of purifiers warmer than the succeeding ones. Mr. D. D. Barnum, of Worcester (Mass.), was asked if he could say exactly the percentage difference in the efficiency of the purifiers with lower and higher temperatures. He said, however, that he could not do this, as he was running two sets of purifiers in parallel, and it was hard to tell, on account of the varying back-pressure in the two series, how much gas went through each set. He maintained the temperature at over 80° in the boxes; but he did not let it exceed 100°. The oxide would take out about 8 per cent. of its own weight of free sulphur each time it was used; and in six or seven times this would give about 50 per cent., which used up the oxide. The amount of gas purified each time was something like 20,000 cubic feet to the bushel, which made about 150,000 feet per bushel before the oxide was sold. In reply to a further question, Mr. Barnum remarked that it was rather a difficult thing to give the previous number of grains per use of each batch of oxide, as compared with the present number of grains of sulphur removed. In mixing coal and water gas, as he did, the mixtures would vary, of course, at different times of day. If, however, they counted on 200 grains in 100 cubic feet of water gas, and 400 grains more or less in coal gas, this would give from 300 to 400 grains per 100 feet entering the purifiers. Running the three boxes, as he did, with one box off, at the outlet of the first box there would be from 150 to 200 grains; and at the outlet of the second, less than 20 grains. There were methods of testing the sulphuretted hydrogen; but it could not be done with rapidity within 20 grains. Unfortunately, he was unable to give the results accomplished when working previously with a low temperature.

The next speaker—Mr. H. F. Coggeshall, of Fitchburg (Mass.)—stated that he manufactured only coal gas; and that in his system of condensation, he ran a pipe round the retort-house one-and-a-half times from the outlet of the hydraulic main to the outlet of the building. Thence the pipe ran 40 feet across the street (boxed up) to the exhauster-room; the temperature at the inlet of the exhauster being about 120° at this time of year. After passing through the exhauster, the gas passed to the tubular condenser, and the water was reduced to about 75°. Then it went through the scrubber and tar-extractor, where another 3° was added; so that the temperature of the gas on leaving the scrubber on its way to the purifiers might be taken as being about 78°. Mr. T. H. Hintze said that at Lowell (Mass.) the exhauster was placed after the condensers—the gas was drawn through the condensers and the tar-extractor before it reached the exhauster. The gas entered the first condenser at about 120°; while at the outlet of the last he aimed at a temperature of 70°. Mr. W. A. Learned, of Newton (Mass.), was then pounced upon by the President (Mr. W. E. M'Kay), and persuaded to give the temperatures observed in his works. He stated that at the inlets of the hydraulic main and air-condenser the figures were 135° and 115° respectively. Then came the exhauster, and after that a water-cooler, where the inlet temperature would be about 90°. At the washer it would be 75°;

and at the "Standard" scrubber, 68° or 70°. After passing through the latter, the temperature of the gas was increased, by means of a heater on the inlet-pipe of the purifier, to 100° in the first box. In the second box there would, of course, be a decrease; and just at the present time the temperature of the gas when it reached the station meter was something like 70°. Under these conditions, the station meter would be 2 per cent. fast—that was 1 per cent. for every 5°.

The discussion was continued by Mr. W. M'Gregor, of Pawtucket (R.I.), who informed the members that he found the gas from the hydraulic main to vary from 120° to 135°, due to the foul main passing around and through a room which was more or less exposed to the outside temperature. It, however, entered the primary air-condenser at 120°, and then passed through the exhauster into the Pelouze and Audouin tar-extractor at 110°, as they found they got the best results from the apparatus at this temperature. Then the gas entered the secondary air-condenser at 100°, the water-tube condenser at 90°, the rotary-scrubber at 80°, and the splasher-washer at 70°. It left the condensing room at a temperature of 65°; and after passing through the purifiers, the figure at the outlet of the station meter was from 65° to 68°. Mr. Sherman, of New Haven (Conn.), impressed upon the members that the secret of using oxide successfully was to keep the room warm, and to keep the oxide warm, as it was practicable to do. His gas entered the exhausters at 132°; and, after passing through the multitubular condensers and "Standard" scrubber, it arrived at the purifiers at 75°. The purifying-house was always kept heated up to from 70° to 72°; and at the station meter, which was several hundred feet away, the gas was generally registered at 70°—and afterwards, of course, when making up the accounts, corrected down to the normal temperature of 60°.

No sooner had this inquiry been disposed of, than the President read out another equally interesting question dealing to some extent with the same subject—namely, "At what point in the works should coal gas and water gas be mixed?" In this respect, some diversity of practice was shown. One member stated that he mixed the gases at the inlet of the exhauster. A second said he had selected the inlet of the purifiers, but that hereafter the mixture would take place in the hydraulic main, at a temperature of from 130° to 140°. Another mixed the gases at the outlet of the purifiers, of which he had two sets—one for water gas and the other for coal gas. He, however, was followed by other gentlemen who stated that they had chosen for the purpose the inlet of the purifiers.

Mr. Barnum, in the course of a long and very interesting speech, remarked that an important point in connection with the question was whether both gases were kept at the same temperature, or whether the coal gas was condensed at a lower temperature than the water gas. He condensed the two together—the crude water gas coming from the relief holder, and the coal gas from the retort-stack 250 feet away. The carburetted water gas first went through small condensers, and left them at 140°. It then passed through larger condensers; the outlet temperature being kept between 100° and 110°. From there, it went to the relief holder, then to the meter, and finally to the inlet of the exhausters, where it met the coal gas from the retorts. The water gas entered the exhausters at a temperature of 75°, while the temperature of the coal gas was 125°; so that the result of a half-and-half mixture would, of course, be about 100° at the outlet of the exhausters. After this, the gas went through very large air condensers, at the outlet of which the temperature was kept between 75° and 80°; and it ultimately left the purifiers at 80° or more, and was measured at the meter at from 69° to 70°. Ultimately it passed the governor at between 52° and 60°. He pointed out that the object aimed at in mixing the two gases in this manner was to take out the heavy tar while it was hot, and to have the two gases mix together at such a time that the vapours in the coal gas that were not in the water gas, and which the water gas could absorb, and the vapours in the water gas that were not in the coal gas, and which the coal gas could absorb, would be taken up by the respective gases. He claimed the following advantages for his arrangement: (1) A quantity of vapour was absorbed and carried by the mixed gas that would otherwise be lost; (2) the resultant vapour tension was much higher, and a larger amount of hydrocarbons was carried in the gas—both in the form of gas as well as in the form of vapour. This resulted in higher candle power, gave more vapours for dissolving naphthalene, and, again, the higher vapour tension would carry further in the distributing system. On the other hand, the disadvantage was that rather larger apparatus—especially scrubbers—was necessary. The condensing, tar-extracting, and purifying apparatus was about the same in both cases. It could not, however, be expected that a plant designed for a make of one million cubic feet of coal gas would be efficient with a million cubic feet of water gas added to it. He remarked that to determine the advantage gained in candle power from running the two gases together in this manner was an exceedingly hard problem; but his results generally showed an increase of 1½ candles in the mixed gas above what it should be if figured from the proportional candle powers—which would show 1 candle gained by mixing hot over and above the ½ candle which Dr. Love had determined was gained by mixing the gases cold.

In answer to a question by one of the members as to how he raised the temperature of the gas passing through the purifiers, Mr. Barnum stated that all his exhaust steam from five engines and two pumps passed through the cellar of the purifying-house, and the pipes were coiled round the bottom of the boxes. In extra cold weather, they turned live steam into the house, but not into the gas. Mr. Learned said he was about to put 40 per cent. of water gas into the hydraulic main. Its temperature would be in the neighbourhood of 130° or 140°, which would be the same temperature as the coal gas at that point. With regard to heating the gas in the purifying-house, instead of heating the house itself he enlarged the inlet-pipe to the purifier—in other words, he put a heater in the inlet-pipe, and charged it with exhaust steam. This brought the temperature of the gas at the inlet of the first purifier to 100° or 105°. He found this easier to do than to heat the whole of the purifying-house.

The above are only two out of the many queries constituting the question-box at the meeting referred to; and yet it is safe to say that everybody present got a "wrinkle" of some sort or other in the course of the discussion to which they gave rise. Of course, it is not every question that is of such general interest as the two with which we have been dealing; but even if it should be only occasionally that so great a benefit to the members and to the industry at large results, this portion of the proceedings of the American Gas Associations is of such value as to amply justify its continuance there and its adoption elsewhere.

REGISTER OF PATENTS.

Chains for Hot-Coke Conveyors.—Graham, M., of Leeds. No. 7339; March 26, 1902.

This roller chain for use in hot-coke conveyors is a further improvement on patent No. 24,659 of 1899; the object aimed at being "to facilitate the renewal of the rollers or runners in such chains, and also to provide a larger bearing-surface at the joints."

The rollers at the joints as hitherto employed are replaced by rollers in the middle of the links; each roller being secured in position by a pin and cotter or other suitable means. Thus the renewal of the rollers does not necessitate taking the chain to pieces. The larger bearing surface at the joints of the chain is obtained by having an enlarged hole in the inside link with side projecting bosses on the outside links and fitting within the enlarged hole.

Coin-Freed Gas-Meters.—Aron, H., of Charlottenburg, near Berlin. No. 7750; April 2, 1902.

This invention relates to gas-meters of the kind which, when a limited number of coins has been introduced, deliver a corresponding quantity of gas, and automatically shut off the supply after the quantity prepaid has been consumed. Among meters hitherto known for this purpose, says the patentee, two forms are principally conspicuous. In the one type, which is generally preferred, the supply of gas is opened and shut off by the direct action of a valve—such as a slide valve or a valve cock; in the other type, the supply is opened and shut off by indirect action—*i.e.*, by setting free and by stopping again a movable part, such as a drum, bellows, or the like.

The present improvements are based upon a combination of the two systems. But it is pointed out that, in combining the two types, "due attention must be had to the reciprocal powers and speed of motion; otherwise no practical result could be obtained." On introducing a coin or coins, a valve will be opened for the supply of gas, and simultaneously a moving mechanism—such as a drum or bellows—will be set free by releasing its stop-motion, as in the engravings (p. 95), which show parts of a wet meter, where the control of the supply of gas is obtained by a planet-wheel gearing. The front elevation of the meter has the front plate removed. In the cross section, the greater part of the gear wheels are omitted, as they form no part of this invention. A detail view of the mechanism is also given, comprising the controlling discs in connection with the valve and with the lever actuating the admission and the shutting off of the gas.

V is the shaft of a planet wheel; the gearing of which comprises three bevel wheels H I and Z. The shaft carries two controlling discs C and D, the index U, and the axis of the planet wheel, rigidly mounted on the shaft by a suitable sleeve. The two crown-wheels Z and I, the gear-wheels N and L, and the lever G, are loosely mounted on the shaft. The index moves along a dial which indicates the number of coins introduced for prepaying the volume of gas to be supplied.

After introducing every single coin, the shaft 1 is turned by the operator, and transmits motion through the bevel-gearing P and Q, pinion S, gear-wheel N, crown-wheel Z, and planet-wheel H, to the shaft V, and to the parts rigidly mounted to them. The return motion of the shaft is obtained by the recording train of wheels, in gear with the wheel L, and imparting motion to the crown-wheel I, rigidly connected to it. An elbow-lever F A serves to stop and release a double-armed lever E, fixed upon an axis T, which receives motion from the recording wheel-train. The shaft carries loosely mounted to it a lever G, the pointed edge K of which is forced to engage a pin O of the disc D, by the pressure of the spring Y; the lever serving to obtain a speedy descent of the other lever F into the notch R, along the edge K for stopping motion. The disc D being very slowly turned by the recording train of wheels, the descent of the lever F into the notch cannot accordingly be performed by the rounded-off edge of the notch, as otherwise the edge 2 of the other lever arm A would slowly approach the speedily revolving lever E, and would repeatedly be struck by it before finally being stopped. On being released, the disc D is speedily turned by hand through the medium of the shaft 1; and the lever F is

speedily lifted from the notch R, and placed upon the circumference of the disc by means of the rounded-off face of the notch.

The mode of performing the release, and of the stop motion, may be explained thus: If coins have been introduced, and the shaft 1 has been turned as described, the discs C and D, with their notches R and 3, and pins O and 4, projecting from the disc D, are turned in the direction of the arrow 5. The pin 4 is thereby withdrawn from the spring M connected to the double-armed lever carrying the valve W. The valve accordingly is speedily opened, as the downwerd motion of the valve is accelerated by the valve's own weight. The lever carrying the valve W is mounted to a shaft X traversing a stuffing-box of the casing. The short arm of the lever carrying the spring blade M is mounted to the shaft X outside the casing.

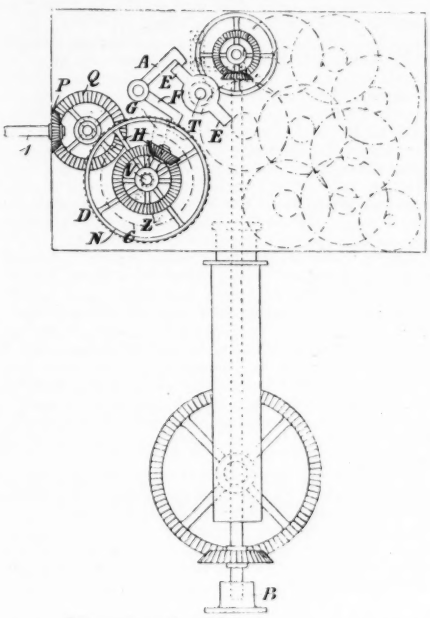


Fig. 1.

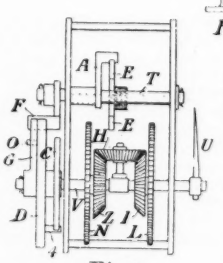


Fig. 2.

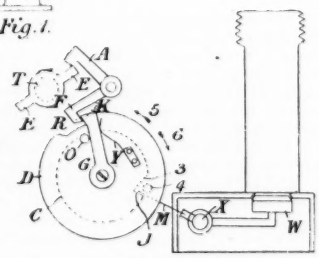


Fig. 3.

On opening the valve as described, the stop motion is simultaneously released through the medium of the disc D. The notch R of the disc is rounded off at the side engaged by the lever F. As long as the meter is being stopped, the lever G, under pressure of the spring Y, covers the notch R. But when the disc D, through the medium of shaft 1 and gearing as described, is speedily turned in the direction of the arrow 5, the lever G yields to the pressure of the lever F, the notch R becomes free, and the lever F is raised by the rounded off edge of the notch and made to ride upon the circumference of the disc D; thus causing the arm A to set free the lever E, whereby the driving mechanism of the meter is allowed to start the motion of the wheel-train. The lever G then resumes its original position, bearing against the pin O of the disc D.

When the volume of gas prepaid has been nearly consumed, the disc D will have been turned back in the direction of the arrow 6 so far as to approach the lever F up to the edge K of the lever G. The pin 4 of disc D now presses down the spring M, thereby gradually closing the valve W and simultaneously warning the consumer. Thereupon the lever F suddenly descends into the notch R, passing by the edge K if the valve is not tight. The other arm A of the lever stops the lever E in its revolving motion, and the supply of gas is entirely cut off.

Purifying Coal Gas and Recovering Bye-Products.—Smith, H. W., of Sutton Coldfield, and Albright, G. S., of Edgbaston. No. 9070; April 18, 1902.

This is a modification of patent No. 13,653 of 1901, for the purpose of removing not only the hydrocyanic acid but also the bisulphide of carbon which was only partially eliminated by the former process.

For this purpose, says the patentees, the liquor is from time to time removed from the sulphur scrubber, is heated in a closed vessel, cooled, and replaced—being used over and over again until it contains sufficient sulphocyanide of ammonia. The heating in a close vessel does not remove the ammonia, but appears to decompose the unstable thiocarbonate of ammonia formed in the process, and which prevents the continued absorption of the bisulphide of carbon. The gas passing out of the sulphur scrubber is (as in the former specification) again scrubbed to purify it from ammonia.

As the liquor is used over and over again (generally five to ten times) before it is sufficiently concentrated to make it desirable to separate the sulphocyanide, it will be obvious that its rate of flow through the scrubber should be increased to a corresponding degree (generally five to ten times as fast as in the former process). Or the ammonia may be distilled off during the heating, in which case sufficient liquor may be passed through the sulphur scrubber to remove the whole of the ammonia from the gas—thus obviating the necessity of a second scrubbing.

In this case, a scrubber containing at least eight compartments is usually desirable. The liquor from the scrubber is allowed to stand, in order to separate any sulphur mechanically carried forward, and is treated in suitable stills to drive off the volatile ammonium compounds. The stills should not be heated by blowing in steam, as this would increase the bulk of the liquor, but preferably with steam coils or a steam-jacket. After the liquor has been raised to the boiling point, however, steam may be admitted to assist in the separation of the ammonia.

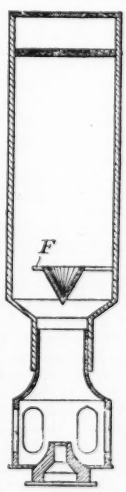
The ammonium sulphocyanide formed is not decomposed in the still; and thus the liquor gradually increases in sulphocyanide contents. When a sufficiently strong solution is obtained, the liquor is removed and worked up for the manufacture of any sulphocyanide desired, and replaced in the scrubbing process by fresh water.

Coin-Controlled Apparatus for Delivering Gas.—Reeves, E. A., of New Haven, Conn., U.S.A. No. 23,572; Oct. 28, 1902.

In the operation of this invention, a coin is placed within a rotatably mounted coin-carrier, and operates a lever which is thrown outwardly and engages a projecting part carrying a pawl; the connection between the coin and valve mechanism being completed through a train of gears. As the coin-carrier is rotated, the valve-controlling mechanism is also rotated through the train of gears, and the inlet-valve is opened a predetermined distance, regulated by the amount of rotation imparted to the train mechanism. This valve is automatically closed by a connection between the valve-closing mechanism and the 2-foot shaft which is in every gas-meter; and it is so connected with it that a predetermined number of revolutions of the 2-foot shaft will automatically return the valve to its original position—thus closing the gas-inlet and shutting off the supply of gas. The valve mechanism is so designed, however, that, by means of a closable aperture through it, a small amount of gas is permitted to pass the valve for a long time after the valve itself has closed, which supply is sufficient to keep the lights burning and warn the consumer that the meter has practically run down, and another coin is required.

Distributors for Bunsen Burners.—Steilberg, R., of Charlottenberg, near Berlin. No. 27,634; Dec. 15, 1902.

This divider or distributor (adapted to be inserted into the tube of compressed gas bunsen burners) has as its characteristic feature the fact that it is closed at its lower part and open at the top. By this arrangement, "a rarefication of the air in the hollow body is produced by the passage of the compressed gas past the latter, which produces a strong eddying of the air and gas mixture." An intimate mixture of the gas passing out under pressure with the air carried with it thus takes place, says the patentee; and the result is a "flame of great heating power, and therefore of high lighting efficiency if used with an incandescent body."

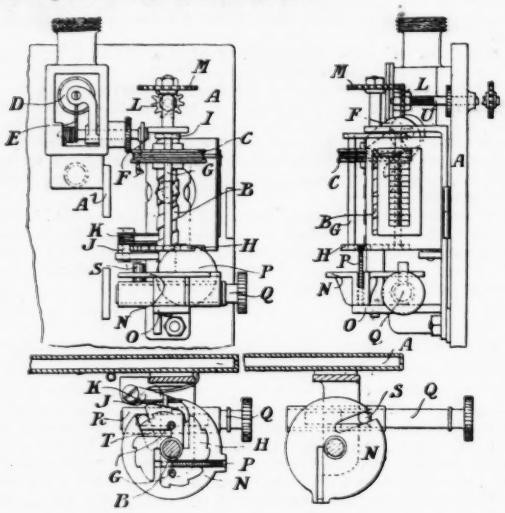


The burner-tube and the socket-tube have (as shown) as large a cross section as possible. In the lower part of the burner-tube, the divider F (of spherical, conical, or any other shape) is situated. It is closed at the bottom and connected by rods with the burner-tube. The air drawn in, and the gas passing between the hollow body F and the wall of the burner-tube, ascends and becomes mixed. The mixture becomes a very intimate one by the fact that the hollow body is open at the top, so that a space in which the air is rarefied is formed, "whereby a considerable eddying of air and gas-mixture is produced." The gas and air mixture produced in this manner give (it is said) a flame of high-heating power; and "by using a suitable incandescent body, a light of more than 1500 Hefner candles is produced."

Coin-Freed Gas-Meters.—Smith, G. B. & E. W., of Kennington, S.E. No. 28,832; Dec. 30, 1902.

This invention relates to improvements in coin-freed mechanism to be added to, or combined with, any ordinary gas meter—being worked by spur wheels and spindle from the mechanism of the meter. The invention consists essentially of a screwed spindle carrying a valve-wheel which travels up and down the spindle. The valve-wheel operates a valve through which the gas passes, and which is normally kept open by a spring, but is capable of being closed by a forked lever outside the valve, and operated by the valve-wheel. The valve-wheel has two holes in it through which pass two guiding pillars or slide keys mounted upon a disc, slotted to receive coins; the pillars being joined at their higher ends by a connecting piece. The disc with the pillars and connecting piece (called by the patentees the "lantern pinion") has in the centre the screwed spindle. When a coin is inserted in the coin-disc, it can be turned in one direction by pulling a slide, the end of which projects from the cover in which the mechanism is enclosed; but a pawl, actuated by a spring, prevents the disc being turned in a reverse direction. The turning of the disc also turns the valve-wheel, and causes it to travel downwards on the screwed spindle, which action

releases the valve-wheel from the forked lever, and the gas-valve is then opened by the spring. As the gas is consumed, the mechanism in the ordinary meter communicates its rotations, through the spur-wheels, to the screwed spindle, which rotates slowly, and thus draws the valve-wheel upwards; and when it again reaches the forked lever and raises it, it closes the valve and shuts off the gas.



A cover or case fits over the mechanism and carries a slot for the coin, which, when inserted, drops upon a table or guide plate and into the coin-carrier and coin-disc—making a sufficiently rigid connection between the carrier and the disc to turn the latter on the carrier being turned. When the carrier is turned sufficiently, the coin passes from off the table and drops into a receptacle below—thus freeing the carrier and allowing the slide to be pushed back and the carrier returned to its first position, ready to receive another coin; the coin-disc being held by the pawl, as before described. This operation can be repeated until a limited number of coins have been received. Then the valve-wheel, having travelled down the screwed spindle to its maximum distance from the valve, obstructs the coin-slot and prevents the introduction of more coins, and so keeps the mechanism from being overstrained.

The operation of the coin-carrier by the slide is as follows: The slide is composed of a rod which slides through the outer casing and through a tube or long bearing fixed to the frame of the mechanism. In this bearing a slot is cut; so that a peg or strut, fixed at right angles in the slide, limits the stroke of same. In the periphery of the coin-carrier another slot is cut; and the peg of the slide slides in this also, so that when the slide is pulled it pulls the coin-carrier through a certain angle, and (carrying a coin) operates the mechanism as before described.

For adjusting the quantity of gas delivered for each coin, a thread is formed upon the spindle connecting the ordinary meter and the present arrangement, and a spur wheel is threaded upon it with lock nuts, so that it can be fixed at any required distance along the spindle to allow for the varying sized wheels used for the varying prices of gas. The valve-wheel preferably carries a ring upon which projects a finger, which, as the wheel moves up and down, indicates upon a fixed dial the amount of gas that has been paid for and is unconsumed.

In the illustrations, A is the side of an ordinary meter to which the mechanism is attached. B is the screwed spindle which carries the valve-wheel C. D is the gas-valve fitted with a spring E and having a forked lever F outside the valve. G are the guiding pillars or slide keys of the "lantern pinion." They are mounted upon the coin-disc H, and connected together at their higher ends by a plate I. J is the pawl which engages with the coin-disc, and which is controlled by the spring K. L and M are the pinions connecting the mechanism of the ordinary meter with that according to the present invention. N is the coin-carrier mounted upon the table O and shown holding the coin P, which connects the coin-carrier with the coin-disc H. Q is the slide by which the coin-carrier and the coin-disc are operated; the slide fitting into the tube or long bearing R and being controlled therein by the peg or strut S. T is the slot in the coin-carrier into which the peg also fits, and by which peg the coin-carrier is moved. U is the threaded spindle on which the meter pinions are mounted. V is the cover for the mechanism, having a slot for the insertion of coins. W is the receiver for the coins.

Additional Capital for the Southend Water Company.—Last Tuesday, Mr. Alfred Richards sold at the Mart, Tokenhouse Yard, 3000 new ordinary £10 shares in the Southend Water Company, ranking for a maximum dividend of 5 per cent., and entitled, in view of the dividends paid on the existing capital, to receive it. They fetched prices ranging from £10 5s. to £10 12s. 6d. each.

South Holderness Gas and Water Supply.—In the "JOURNAL" for the 24th ult., a report was given of the proceedings in connection with an inquiry held by Mr. Ingram B. Walker into an application made to the Board of Trade, by Mr. R. S. Emerson, for a Provisional Order to enable him to carry out a scheme of gas and water supply for South Holderness. The application was opposed by the Hedon Corporation, the Hedon Gaslight Company, and other bodies; and among the witnesses called by them were Mr. J. Holliday, Assoc.M.Inst.C.E., F.C.S., the Engineer and Manager of the Sutton, Southcoates, and Drypool Gas Company, and Mr. F. J. Bancroft, B.Sc., the Water Engineer to the Hull Corporation. The points they brought before the Inspector were so unanswerable that the Order has been refused.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Blue Water Gas Controversy.

SIR,—If Mr. Lane will again carefully read my letter in your issue of the 24th ult., he will find most of his questions answered as far as I am concerned.

Coke sells at an average price of 11s. per ton here; and I have, therefore, charged it at that price. The make of purified blue water gas per ton of coke is 60,000 cubic feet, and would be higher but for intermittent working. For the boiler, the refuse from the coke can be used. Mr. Lane's third question, I do not altogether understand. My water-gas plant is so arranged that it only requires one man to work it; and that is all the labour I now employ—the boy having been dispensed with—except that I allow the water-gas maker the assistance of two labourers for the first hour in the morning, to do the clinkering. We only work the plant (as I stated before) during the day; and on days when it is not at work, the water-gas maker is put to some other employment about the works. I do not make 18-candle gas, and have no intention of doing so. All my carburetting is done at the outlet of the station meter and the inlet of the holders. Consequently, whatever carburetting I may do, does not affect my figures as to volume.

With reference to Mr. Lane's suggestion as to the alleged possibility of swelling the figures by working the generator so as to make carbonic acid, I cannot see where the advantage would be in going out of one's way to do this; and moreover as, in the Lewes process, the whole of the coal and water gas mixed has to pass through the purifying plant (which in my case includes four lime boxes for dealing with carbonic acid alone), an over-production of carbonic acid in the generator would not help my good working in the least—quite the reverse, for the whole of the carbonic acid is removed before the gas can reach the station meter and be measured. I might add that, in any case, to run up one's make with large additions of carbonic acid, and then make up the quality with enrichment would be an expensive, and not altogether satisfactory, method.

Analyses of the crude water gas here show that the carbonic acid in it varies from 4 to 5 per cent. A calorific test made by Mr. Hills of the mixed gas, I gave in my previous letter to the "JOURNAL."

I carburet with benzol in a carburettor which is practically automatic in its action, requiring only the occasional attention of the foreman or engineman, and registers the quantity of benzol used. I find that my cost of enrichment works out to about 1d. per 1000 cubic feet of mixed gas.

The coal is weighed into the retort-house; the weight of coke used at the water-gas plant is taken; there is a meter to register the make of water gas, and another one to register the quantity admitted to the retorts; we have as perfect a system of purification as I think is possible; and the total quantity of mixed gas for the town consumption is measured after purification and before any enrichment is added. I therefore do not see much room for error in the figures of the results. For the benefit of those who wish to know what coal I am using, I may say that it is two-thirds North Staffordshire, and the remainder equally divided between Broughton, West Yorkshire Silkstone, and Eckington. I use no cannel. I work with the dry main, of course; for I could not get anything like the same results with the hydraulic main.

As there appears to have been some amount of incredulity expressed as to the results I am getting, I shall be very pleased for any gas engineer, or other gentleman interested, to come down here and watch a week's working (or longer if he likes), checking all weighings, meter registers, and figures.

To continue the record of results I have already given. For the past three weeks, while using coal out of stock, the net make of coal gas (deducting the water gas added) fell to 11,771 cubic feet per ton; while for the month of March the net make of coal gas (deducting the water gas added) was 12,081 cubic feet per ton. The average illuminating power of the gas was 15·24 candles; and the benzol used was 0·081 gallon per 1000 cubic feet. The enrichment thus cost less than 1d. per 1000 cubic feet.

There is no magic in the matter. It is well enough known that there are valuable hydrocarbons condensed into the tar, and others decomposed—resulting in carbon in the retorts, naphthalene, and stopped ascension-pipes. If these hydrocarbons can be retained in the gas, they mean a material gain; but they appear to need a carrier or fixing medium, and my working of the Lewes process so far proves blue water gas to be a very useful and effective one. I am having no trouble from naphthalene or stopped pipes, nor does there seem to be much deposition of carbon.

At the same time, to be a success, the system wants careful watching, or the results may be the reverse of satisfactory. Good, even charges are needed in the retorts; and it is highly necessary that there should at no time be any back-pressure in them. I have a gauge fixed on one of the ascension-pipes, so that the foreman may see that there is always a slight vacuum. The reason for this especial precaution is that hydrogen, which is a large constituent of the water gas, has such a light specific gravity that any back-pressure causes it to diffuse through the walls of the retort, and there is a reduction in volume. I also have the dry main flushed out morning and evening. The water gas is turned on to the retort as soon as it is charged, and kept on for four hours, when it is turned off and the charge carbonized for a further two hours. The stokers, however, are not above forgetting the water-gas cocks occasionally, and even leaving them full on while drawing and charging—with consequent loss of gas. A word to the wise, in this, is sufficient.

I tried the experiment of taking the gas off both ends of the retort—thus allowing the water gas to pass straight up the ascension-pipe instead of through the retort. The result was a drop in the illuminating power of about 2 candles; and in the make of about 700 cubic feet per ton.

Tipton, April 9, 1903. SIDNEY O. STEPHENSON.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the rising of the House for the Easter holidays last Wednesday:—

Bills read a second time and committed: Nantwich Urban District Council Bill [Lords], Plymouth and Stonehouse Gas Bill [Lords].

Bills reported with Amendments: Maidstone Gas Bill, Sittingbourne District Gas Bill.

Bills read the third time and passed: Bath Corporation Water Bill, Bridgwater Gas Bill, North Middlesex Gas Bill.

The Ebbw Vale Water and Improvement Bill and the Nantyglo and Blaina Water Bill have been referred to a Select Committee, consisting of Mr. Baldwin (Chairman), Mr. C. P. Allen, Mr. Fitzroy, and Mr. Levy; to meet on the 28th inst.

Wellington Gas Bill Agreed. The negotiations between the Wellington District Council and the Gas Company over the Bill of the latter have been successful. Several concessions have been made. It is regretted that one of them involves the withdrawal of the clause empowering the Company to establish a renewal fund of 1 per cent. on the paid-up capital out of revenue. The additional capital is also to be reduced by £5000; and in regard to the electric lighting clause in the Bill, these words have been added: "That the Company shall not have power to apply for a Provisional Order, except with the consent of the Urban Council." The standard price of gas is to be reduced from 4s. to 3s. 9d. per 1000 cubic feet, with 2s. 6d. increases or decreases in dividend per 1d. reduction or increase in the price of gas. A new clause is also inserted making the maximum price of gas for public lighting 4d. per 1000 cubic feet less than the price charged to ordinary consumers for lighting purposes.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, April 3.

(*Before Mr. Justice* BYRNE.)

Bradford Corporation v. Sir Titus Salt, Bart., Sons, and Co. Interference with Water Easements.

This was an application by plaintiffs for an injunction to restrain defendants from placing ballast on, or altering the level of the surface of, the intended new road now being constructed by the Company between the junction of Bingley Road and Saltaire Road and Titus Street, in such a manner as to endanger the plaintiffs' water-main lying beneath the site of the intended new road, or so as to render the maintenance or reconstruction of the main substantially more costly than it is at present; also for a mandatory injunction ordering the defendants to remove all ballast already placed by them on the site of the intended new road.

Mr. CRIPPS, K.C., and Mr. UNDERHILL appeared for the plaintiffs; Mr. LEVETT, K.C., and Mr. FORD represented the defendants.

Mr. CRIPPS said the defendants were threatening to interfere with certain easements and rights which had been granted to the plaintiffs. The supply of water to Bradford was in the hands of the Corporation, and the complaint they made against the defendants was that they were proposing to tip and make a new road which would seriously interfere with those easements by endangering the existing pipe—in the first place, owing to the additional pressure; and, secondly, by making it much more difficult and costly for the plaintiffs to get at the pipe in case of a burst. The Corporation did not wish to adopt a dog-in-the-manger policy if they could come to some arrangement so far as the pipe was concerned. The pipe in question affected the water supply of something like 150,000 people. If his learned friend who appeared for the defendants would say that they would carry out such works as were necessary to leave the plaintiffs in the same position as they were now, he would accept it at once. The Corporation quite realized that the defendants were anxious to develop their estate; but public interests must nevertheless be protected.

Mr. LEVETT said his Engineers told him that it would only cost a little more to get at the pipe under the proposed road; and the defendants were quite willing to give any indemnity against extra cost in repairing.

Mr. CRIPPS said he could not accept such an indemnity. Plaintiffs were responsible for the water supply of Bradford, and could not run any risk of having it cut off.

Mr. LEVETT said the real point was the experts on each side could not agree. His experts said there would be no danger whatever.

Evidence in support of the plaintiffs' case was then given.

Mr. *G. H. Hill* said that if the embankment it was proposed to make was placed over the plaintiffs' pipe, the tendency might be to depress the ground and cause a fracture. Such a great risk ought not to be incurred if it could possibly be avoided.

Mr. *J. Watson*, Water Engineer to the Corporation, gave evidence as to repairs to the pipe in past years, and expressed the opinion that if the defendants constructed the proposed road it would make repairs more costly than they were at present. There would also be danger of a fracture. Interference with the pipe would be a serious matter.

Saturday, April 4.

On the resumption of the hearing this morning,

Mr. *Watson*, in cross-examination by Mr. LEVETT, denied that the conduit would bear a weight of 2 tons to the square foot. He said the soil was clay, with a considerable dip. He did not agree that there would be only a pressure of 11 cwt., for the plans provided for gas, water, and sewer pipes, which would represent a very dangerous pressure on the Corporation mains.

Mr. LEVETT said the plaintiffs need not trouble about the gas, sewer, or water pipes. On behalf of the defendants he would undertake not to lay any pipes at this particular spot.

After a few questions had been put by his Lordship, it was intimated that a compromise was possible. A conference then took place between Counsel, and terms were agreed upon; the defendants undertaking not to lay within the easement area any mains, sewer, water, or gas pipes; pay £300 towards the cost of altering the existing pipes, and stay all proceedings except for the purpose of enforcing the order.

Justice BYRNE assented, remarking that it seemed to him to be a very right kind of settlement between two such parties.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, April 7.

(*Before Mr. Justice* RIDLEY.)

Llandrindod Wells Water Company v. Hawksley and Others.

This was an action to recover a portion of the fees paid by the Company on taking up an award in an arbitration between them and the Llandrindod Urban District Council, on the ground that the amount was excessive. The case was before his Lordship on the 2nd inst. (*ante*, p. 35), and judgment reserved. This was delivered to-day.

Justice RIDLEY said the action was to recover £119 5s., money paid in excess of reasonable fees due to Mr. Charles Hawksley, Mr. James Mansergh, and Sir George Bruce on the taking up of an award which had been made by defendants; and the question was whether the fees went beyond those which were reasonably due. Although it was not a matter of frequent occurrence, it seemed to be fully established that, if the fees which had to be paid were more than reasonable, the persons taking up the award were entitled to recover the excess. In this case, £476 12s. had been paid to take up the award in an arbitration for the acquisition of the undertaking of the Company by the Urban District Council. After the hearing, the Umpire (Sir George Bruce), at the request of the parties, went to Wales and viewed the property. Upon his return he received from the Arbitrators their valuations, and then formed his own judgment—awarding £13,820 as the amount to be paid for the property. Defendants were asked to give particulars of their charges; and they so far complied as to state that the Umpire's amounted to 195 guineas and the Arbitrators' 120 guineas each—the Solicitors' charges for settling the award being £19 17s. On being asked for further details, they declined to give them, and said they did not consider it desirable or consistent with their dignity to supply such particulars. He could not say that he recognized any necessity for such silence. The Master, in taxing the costs between the Company and the Council, had disallowed the sum of £119 5s. There was no difficulty in ascertaining what was the sum due; and, making allowance for everything urged on defendants' behalf, he thought that the amount charged was excessive. He therefore found in favour of the plaintiffs, with the slight exception that he thought the Taxing Master might have allowed 25 guineas instead of £25 a day to each of the defendants. The amount due would therefore be £374 4s. 6d., and plaintiffs were entitled to the difference between that sum and £476 12s., £102 7s. 6d. There would be judgment for this amount, with costs.

Stay of execution was granted with the view to an appeal.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, April 7.

(*Before the* LORD CHIEF JUSTICE *and Justices* WILLS *and* CHANNELL.)

The King v. New River Company.

Mr. BOYLE, K.C. (Mr. ROSKILL, K.C., with him), appeared on behalf of the New River Company to show cause against an order obtained on the 10th of December last why a writ of *mandamus* should not issue requiring the respondents to issue their warrant to the Sheriff to summon a jury to inquire and assess certain compensation. Under an Act of 1897, the New River Company were authorized to build an aqueduct from Sunbury to Hornsey, and to purchase lands for the purpose. On March 22, 1899, a notice to treat was served to take a paddock forming part of the property known as "The Firs," at Station Road, Hornsey. After this notice, the owners served a counter-notice, under section 92 of the Act, requiring the Company to take the whole. The Company accepted the counter-notice on May 8, 1899. On the 14th of June, a claim was sent in to the Company, and certain negotiations took place; but nothing came of them. On March 4, 1901, the Company served notice on the claimants of their intention, within ten days, to summon a jury; and they made a formal offer of £1950. After the expiration of the ten days, the warrant to the Sheriff to summon a jury was prepared and sealed; and on March 25, 1901, the Company notified that unless they heard within a week that the formal offer was accepted, the warrant would be lodged with the Sheriff. Negotiations again took place, with the result that on May 28, 1901, the offer of £1950 was

accepted, and the money was deposited in the London and County Bank. On the 30th of October the Company took possession, and when the draft agreement was sent, it appeared that there was no right-of-way to the property, although this had never been suggested during the negotiations. He submitted that there was a complete contract with the parties to sell all their rights for £1950.

Mr. MACMORRAN, K.C. (Mr. FORBES LANKESTER with him), contended that there was no concluded contract, as the parties never were *ad idem;* and, further, that the contract expressly excluded any right-of-way.

Their LORDSHIPS discharged the rule, with costs.

THE SALE OF SPURIOUS MANTLES—A WARNING.

At the Liverpool City Police Court on Monday last week, before the Stipendiary Magistrate (Mr. W. J. Stewart), William Shelkes, of 22, Fontenoy Street, Liverpool, was summoned under the Merchandise Marks Act for having unlawfully sold incandescent gas-mantles, and boxes containing the same, to which a false trade description was applied, so as to be reasonably calculated to lead persons to believe that the said incandescent gas-mantles and boxes were the manufacture or merchandise of the Guaranty Incandescent Mantle Company, Limited. The summons was issued on the information of Mr. E. A. F. Schulze, the Managing Director of the Guaranty Company.

Mr. FRANCIS DARCH (of Messrs. Cave and Co., London), after the defendant had pleaded "Not guilty," said that he would be able to prove the purchase of mantles, on Monday of the previous week, from the defendant, which he (defendant) described as "Dura" mantles. The word "Dura" belonged to his clients. For a considerable time past, they had found that their trade name had been inscribed on boxes containing spurious mantles sold in various towns; but they had not been able to ascertain the name of the manufacturer. These mantles, which were not the genuine "Dura," were put up in boxes exactly similar to those used by his clients. The word "Dura" had been used by his clients for the last two years. They were the first to apply the word to incandescent mantles; and they had continually used it ever since. On the 20th of March, a writ was taken to this defendant by a shopkeeper for selling these mantles; and he told the shopkeeper to pay no attention to the writ, and laughed at it. A search warrant was thereupon granted by His Worship; and two detectives subsequently entered the defendant's warehouse, when he denied that he had any of the mantles. After considerable search, however, spurious mantles were found. Defendant said he obtained some from his (Mr. Darch's) clients and some from other firms. He supposed that the defence would be that the defendant had acted innocently, but he would be able to prove that this was not so. The matter was a very serious one from plaintiffs' point of view, as the spurious mantles were very much inferior in quality, and brought plaintiffs' goods into disrepute. He believed quite a trade was done in Liverpool in spurious mantles of his clients', and of those of the Welsbach Company.

Mr. *E. A. F. Schulze*, Managing-Director of the plaintiff Company, in answer to Mr. DARCH, said the Company was incorporated on March 6, 1902. They acquired the goodwill of the business which had previously been carried on by him and his former partner, under the style of the Guaranty Incandescent Mantle Company. The word "Dura" was adopted by him and his partner in January, 1901, as a distinctive trade name for mantles manufactured by them. They had always adopted the present make-up of their boxes. Besides other printed matter, the boxes had, since June of last year, borne the words: "Manufactured under Licence from the Welsbach Company." The mantles were known throughout the trade as Guaranty "Dura" mantles. In conclusion, witness remarked that they had taken proceedings in the Chancery Division, and obtained an injunction in respect to these very mantles.

Mr. *David Hill*, a jeweller of Walton Road, Liverpool, said that he had sold these mantles; and he produced a dozen sold to him by the defendant. He had since been injuncted by the High Court from dealing with the mantles sold to him by the defendant. When he asked for "Dura" mantles, he expected to get the Guaranty Company's goods. He also said that the plaintiff Company had come to the conclusion that he was acting innocently in selling the spurious mantles, and they had waived their costs of the injunction in the High Court.

Mr. *Morris Hill*, father of the last witness, stated that he had dealt in the spurious mantles. On his son being served with a writ and a notice of motion, he took the writ to the defendant, who laughed at it, and told him to pay no attention to it.

Detective *Pierpoint* deposed to having searched the defendant's premises by warrant in company with Detective-Sergeant Jackson. The defendant stated that he had no spurious "Dura" mantles; but the officers found a number of them, which they seized. Defendant said that he had bought some from Altman and some from Van Hinden, and he could not tell which were which. The stock, however, was separated from the genuine mantles, and identified by Mr. Schulze.

This being all the evidence,

Defendant stated that he had been selling mantles for the last nine months. He bought them from Liverpool firms, and paid 27s. 6d. and sometimes 27s. 3d. a gross for them. He had bought some from one of the companies for the simple reason that the Manager had an account with him, and he took the mantles instead of cash, stating that he did not know they were fraudulent imitations of the "Dura." The Magistrate remarked, "That does not matter; you are responsible." Continuing, witness said he did not know that anything was wrong with them. He had given strict orders at his place only to sell the real ones.

His WORSHIP (to defendant): You are liable to imprisonment for four months, or to a fine of £20. You will be fined £5 and two guineas costs.

Mr. DARCH: I also apply for an order for the destruction of all the mantles seized.

The application was granted.

MISCELLANEOUS NEWS.

PARIS GAS SUPPLY.

The Competition for the New Concession.

In recent issues of the "JOURNAL," we have noticed very briefly the progress of the investigation by a strong Committee of the Paris Municipal Council, presided over by M. Deville, of the various projects submitted for carrying on the gas supply of the city at the end of the present concession (Dec. 31, 1905). When the matter was last referred to—in the issue for the 24th ult.—the Committee had formulated a series of conditions which it was thought advisable for the competitors for the concession to undertake to comply with, before anything like an agreement was entered into. One of these, it may be remembered, was that the price of gas should be 15c. per cubic metre (3s. 5d. per 1000 cubic feet). A Sub-Committee met on the 27th ult. for the purpose of hearing what the parties concerned had to say in regard to the conditions. The representatives of the Paris Gas Company expressed their willingness to accept, as a general principle, the figure named, but they could not undertake to supply gas at this rate at the outset. They thought the price of 20c. should remain in force for the first twelve years of the new concession, after which it might be gradually reduced until it reached the stipulated rate, which is exactly half that charged up to the close of last year. The Company declined to consider their assets to be the property of the City as from the date of the new concession; nor would they guarantee to raise their loan at the rate paid by the Municipality. Another point was as to taking back workmen who had gone out on strike. The Company said they were ready to do this so far as the requirements of the service would permit, but they declined to make an all-round pledge. At a subsequent sitting, the proposals of MM. Damour, Dehaynin, and de Sinçay and of MM. Devaluez and Duchanoy—the former backed by the Comptoir National d'Escompte, and the latter by a group of Americans in which Mr. Rockefeller figures prominently—were considered. The Sub Committee decided not to entertain the offer of the Gas Company, but to pronounce in favour of the other two. As, however, the American scheme had met with not a little opposition, owing to the source whence the capital for working it would be derived, as well as on other points, the chances of success seemed to rest with the Damour-Dehaynin-de Sinçay combination. A reporter (M. Chautard) was appointed, and it was stated to be the intention of the Committee to ask the Prefect of the Seine to postpone for a few days the further discussion of the question in the Municipal Council.

The Gas Committee met again on the 1st inst., and heard the report of M. Chautard. The result was that they decided to reject the Gas Company's proposals; and, being desirous of bringing the business to a close, they requested the Sub-Committee to state categorically which of the remaining schemes they recommended. This matter was under their consideration until Saturday, when they reported to the full Committee, with the result that the latter decided in favour of the American project. The reason for this decision is stated to have been the assurance given by the promoters that, whatever may be the amount of profit realized from the undertaking, they will hand over to the City, during the entire period of the concession, a minimum sum of 17,000,000 frs. (£680,000) annually. Another feature of their scheme which caused it to be favourably regarded was that, while the projects emanating from Frenchmen provided for liquidating the capital in the working expenses, the Americans will exclude these payments from the total profits to be divided. Their scheme was accordingly forwarded to the Administration, in order that a Treaty embodying its proposals may be drawn up to safeguard the interests of the City. The Committee had another meeting last Tuesday, when it was decided that during the holidays three members should remain in Paris in order to be at hand to render any assistance the Prefect of the Seine might require in the preparation of the Treaty. If this should be accepted by the Municipal Council, the gas supply of Paris will before very long pass out of the hands of the present Company. But it will not do to reckon too confidently upon this. The motto of the Nationalist majority in the Council is "France for the French;" and as the scheme recommended by the Committee for submission to the Council has been generally associated, as already mentioned, with the group of American capitalists who have been in Paris since December negotiating for the concession, they may "vote solid" against it. MM. Devaluez and Duchanoy, however, who are its nominal projectors, have declared in the columns of the "Matin" that it is not American, but French; and that their Company will be French, and managed exclusively by Frenchmen. If they succeed in obtaining credence for this statement, acceptance of the scheme seems tolerably certain. It is worthy of note that M. Deville, who has presided over the deliberations of the Gas Committee since its formation, is now President of the Council; and in the course of his opening address at the meeting of that body on Wednesday, he reminded them that one of the important matters to come before them for settlement was the gas question. The Council will not meet again till the 25th inst.

PUBLIC LIGHTING IN AMERICAN CITIES.

According to an article in a recent number of the "Engineering Record," Mr. R. G. Monroe, the Commissioner for Gas, Electricity, and Water Supply in New York, has recommended the installation of municipal plant for the public lighting of the city, and estimates for it are being prepared. He was led to do this after studying a report presented to him by Mr. Charles F. Lacombe, the Engineer of Surface Construction in the city, some figures from which we give from our American contemporary.

In order to compare the price New York pays for electric and gas

lighting with the charges in other cities, returns were procured from 175 places having from 25,000 to 1,600,000 inhabitants. The results of the returns from the first hundred cities answering were arranged in tabular form, and (somewhat condensed) they are given below :

Cost of Arc Lamps in Municipal Plants.

	No.	Price per Ann.
Lamps of 1200-candle power—		
Jamestown	338	$48·00
Jacksonville	220	54·00
Grand Rapids	529	68·54
Lamps of 2000-candle power—		
Columbus	320	47·00
Chicago	4640	53·51
Detroit	2133	63·82
St. Joseph	70	70·12
Allegheny	1414	74·29
Jacksonville	151	90·00

Cost of 1200-Candle Arc Lamps in Private Plants.

$55 *to* $75.—Duluth, 364; Norfolk, 350; Covington, 290; Portland, 305; Rochester, 450; Savannah, 513; Concord, 130; Hartford, 799; Springfield, 900; Des Moines, 178.

$82 *to* $87.—Gloucester, 66; New Haven, 550; Bridgeport, 525; Chester, 184; Lawrence, 185; Kingston, 131; Brockton, 268.

$92·50 *to* $100.—Elizabeth, 150; Dallas, 350; New Bedford, 211; Cambridge, 553; Chelsea, 224.

At Yonkers (N.Y.) there are 324 lamps, at $109·50; and in New York City, 872 lamps, at $125.

Cost of 2000-Candle Arc Lamps in Private Plants.

$60 *to* $70.—Evansville, 300; Erie, 449; Portland, 712; Wilmington, 298; Peoria, 641; Saginaw, 291; Seattle, 157; Dayton, 435; Altoona, 222.

$71 *to* $80.—Oswego, 243; Salt Lake City, 425; Washington, 939; Cincinnati, 3750; St. Louis, 2650; Superior, 163; Davenport, 58; Mobile, 275; Johnstown, 265; Rochester, 2350; Lexington, 306; Elmira, 328; Knoxville, 330; Birmingham, 245; Burlington, 203; Harrisburg, 418

$81 *to* $90.—Los Angeles, 1050; Harrisburg, 418; Atlanta, 819; Kansas City, 459, Cleveland, 1076; Milwaukee, 1812; Toledo, 1012; Binghamton, 355; Louisville, 1758; Lancaster, 312; Chattanooga, 225; Indianapolis, 1500; Memphis, 350; Nashville, 382; Syracuse, 1282; Poughkeepsie, 306; Denver, 968; Lawrence, 169.

$92·87 *to* $100.—Trenton, 388; Omaha, 446; Des Moines, 70; Pittsburg, 2530; Jersey City, 1377; Charleston, 163; Newark, 1859; Baltimore, 1584; Hoboken, 246; Fitchburg, 304; New Orleans, 1664.

$102 *to* $109·79.—Paterson, 741; Atlantic City, 376; Minneapolis, 203; Worcester, 744; Fall River, 789; Utica, 693; Lynn, Mass., 286.

$110·12 *to* $125.—Philadelphia, 9426; Manchester, 494; Providence, 1870; San Francisco, 930; Camden, 509; Albany, 671; Boston, 3670 ($124·10); Haverhill, 47.

New York has 3876 lamps at $146.

Charges for Gas Lighting in Various Cities.

	No. of Burners.	Price Paid.
Welsbach burners—		
Chicago	11,025	$18·55
Baltimore	6,174	21·40
Dayton	700	22·50
Portland	329	23·00
Charleston	400	23·50
Seattle	5	24·00
Cleveland	5,452	24·56
Wilmington	518	25·75
Milwaukee	2,500	28·00
San Francisco	5,079	28·60
New Bedford	713	28·75
Rochester	143	29·00
Cambridge	284	29·88
Boston	9,119	30·00
New Haven	1,009	30·00
Yonkers	1,624	30·00
Lancaster	270	30·00
Jersey City	460	30·00
Providence	793	30·00
Omaha	1,050	30 00
Worcester	500	30·00
Binghamton	176	31·00
New York (Manhattan)	4,138	29·00
,, (other boroughs)	3,956	30·00
Open-flame burners—		
Wilmington	31	13·80
Chicago	13,852	16·15
Cincinnati	2,500	16·75
Hoboken	71	17·50
Paterson	450	18·00
Washington	6,989	20 00
Nashville	525	20·00
Camden	289	21·00
New Haven	37	22·00
New York (Manhattan)	2,981	12·00
,, ,,	1,585	13·04
,, ,,	8,854	17 50
,, (Bronx)	2,020	22·00
,, ,,	3,586	24·00
,, (Brooklyn)	6,383	16·00
,, ,,	4,266	28·00
,, (Queens)	2,742	25·00

It was found that the cost of coal, the number of lights, and the length of contract had no comparative effect upon the prices paid. New York, using 4748 arc lamps, pays from $125 to $146 each; while Evansville, with 300 lamps, pays $60. Wholesale use, while it cheapens the price to the private consumer, is of little benefit to cities. The table for gas lights is smaller than that for electric lights, because out of the hundred cities only 34 use gas for street lighting in a way which permits of intelligent comparison with New York.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 88.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	19—20	+½	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 13	6½	Bombay, Ltd.	5⅞—6⅛	..	5 4 0
140 000	5	,,	6½	Do. New, £4 paid	4¼—4⅜	..	5 9 5
300,000	Stk.	Feb. 26	12	Brentford Consolidated	240—245	..	4 18 0
286,700	,,	,,	9	Do. New	177—182	..	4 18 11
50,000	,,	,,	5	Do. 5 p.c. Pref.	131—136	..	3 13 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	110—113	..	3 10 10
220,000	Stk.	Mar. 12	10⅝	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk.	151—155	..	5 0 0
460,000	20	Mar. 31	10	British	38½—39⅜*	..	5 1 3
100,000	Stk.	Mar. 12	6	Bromley, 5 p.c. "A"	118—123	..	4 17 7
165,700	,,	,,	4½	Do. 3½ p.c. "B".	90—95	..	4 14 9
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd	10¾—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	Mar. 12	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	104—107	−1	4 13 5
503,750	,,	,,	4¾	Do. 3½ p.c. ,,	99—102	..	4 13 2
407,817	,,	—	3	Do. 3 p.c. Deb.,	89—92	..	4 5 4
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	115—125	..	6 8 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Feb. 26	5⅛	Crystal Palace Ord. 5 p.c	115—120	..	4 8 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	120 —125	..	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140	..	3 11 5
486,090	10	Jan. 29	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 12	4⅛	Gas-light and Coke { 4 p.c. Ord.	81—83	+1	5 6 0
2,600,000	,,	,,	3½	3½ p.c. max.	85—87	..	4 0 6
3,799,735	,,	,,	4	4 p.c. Con. Pref.	100—105	..	3 16 2
4,193,975	,,	Dec. 11	3	3 p.c. Con. Deb.	89—91	..	3 5 11
2,2,500	Stk	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Oct 30	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,600,000	Stk.	Nov. 13	10	Imperial Continental	204—207	..	4 6 7
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	100 —103	..	3 8 0
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
501,000	Stk.	Feb. 26	10	Liverpool United A	219—221	..	4 10 6
718,100	,,	,,	7	Do. do. B	161 —163½	..	4 5 8
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.	113—115	..	3 9 7
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4½—5	..	5 0 0
560,000	100	April 1	5	Met. of { 5 p.c. Deb.	103—107*	..	4 13 6
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	101—103*	..	4 7 5
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9¾—10¾	..	6 13 4
1,515,892	Stk.	Feb. 20	4½	Newc'tle & G'tesh d Con.	103⅜—104⅜	..	4 6 2
376,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.	97—98	..	3 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	143—148	..	5 8 1
600,000	5	Mar. 31	7	Ottoman, Ltd.	6—7*	..	5 0 0
					* Ex. div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
105,005	Stk.	Jan. 15	6⅛	Ply'mth & St'house 5 p.c	127—132	..	4 12 9
851,070	10	Oct. 15	7	River Plate Ord.	11—11½	+¼	6 1 9
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
250,000	10	Sept. 26	8	San Paulo, Ltd.	12—13	..	6 3 1
135,000	Stk.	Mar. 12	10	Sheffield A	234—236	..	4 4 9
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111—114*	..	4 7 9
6,000,000	Stk.	Feb. 12	5½	South Met., 4 p.c. Ord.	117—120	..	4 8 10
1,780,000	,,	Jan. 15	3	Do. 3 p.c. Deb.	91—93	..	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.	100 —103	..	3 17 8
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton { A. 5 p.c. B. 3½ p.c.	117—122	..	4 13 4
300,520	,,	,,	4½		93—96	..	4 13 9
182,380	10	Dec. 30	8	Tuscan, Ltd.	8½—9½	..	8 8 6
149,000	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
730,872	Stk.	Mar. 12	5	West Ham, 5 p.c. Ord.	95—100	..	5 0 0
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11⅛	Chelsea, Ord.	310—320	..	3 11 11
150,000	,,	,,	5	Do. 5 p.c. Pref.	145—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	130—140	..	3 4 4
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb.	137—142*	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.	227—232*	..	3 9 0
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
700,000	50	Dec. 11	8	Grand Junction { 10 p.c. max. 4 p.c. Deb.	117—122	..	3 5 7
310,000	Stk.	Mar. 31	4		123—128*	..	3 2 6
708,000	Stk.	Feb. 26	10½	Kent	29 —300	..	3 10 0
160,000	,,	,,	7	Do. New, 7 p.c. max.	195—205	..	3 8 4
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.	300 —3 0	..	3 11 0
406,200	100	,,	8½	Do. 7½ p.c. max.	215—225	−5	3 15 0
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb.	122—127*	..	3 3 .
500,000	100	Feb 12	12⅝	New River, New Shares	390—400	..	3 4 0
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb.	123—128	..	3 2 0
902,300	Stk.	Dec. 11	7	South-wark and { Ord. 7½ p.c. max. 5 p.c. Pref.	205—210	+3	3 6 8
126 500	100	,,	7		190—200	..	3 10 0
489,200	Stk.	,,	5		150—153	−1	3 5 4
1,019,585	,,	Mar. 31	4	Vauxhall 4 p.c. A Deb.	122—125*	..	3 3 0
1,155,066	Stk.	Dec. 11	10	West Middlesex	290—300	..	3 6 8
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	138—143	..	3 2 11
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb.	95—97	..	3 1 10
					* Ex. div.		

In recommending municipal ownership for New York, Mr. Lacombe gave some details of the municipal plants in operation in Chicago, Detroit, Allegheny, and Jacksonville. In Chicago it costs $53·51 to produce a 2000-candle power arc light running all night and every night; this charge being inclusive of the cost of new materials and repairs. In the last 16 years of operation, a sum of $3,400,663 has been expended for lighting the city and putting up the plant; whereas if private companies had done it at prevailing prices it would have cost $3,535,875, and there would have been no plant in hand. If the price at which Chicago furnishes light were doubled, it would still be nearly $40 per lamp below the price now paid in New York. No bonds have been issued by Chicago, and nothing is owing upon the plant, which has cost up to now $1,694,000. When the municipal plant at Detroit was built, $650,000 in bonds was issued, and since then $932,000 has been spent, which includes some renewals and considerable subway construction. Detroit does not make quite so favourable a showing as Chicago; but in ten years before the building of the municipal plant (from 1885 to 1894 inclusive), Detroit paid an average price per lamp of $177·27, with an average number of lamps of 803. It paid for the year ending June 30, 1902, according to its own statements, $53·82. Though this latter figure has been criticized as not providing for a proper depreciation charge, in any case the price is much lower than that which New York pays. Allegheny has a municipal plant which furnishes 1,414 2000-candle power lamps at the rate of $74·29 per lamp, and public buildings at 2·74c. per kilowatt-hour. It issued $260,000 in bonds to build its plant, but has since paid into the sinking fund upwards of $82,000 to redeem them. The city of Jacksonville, Fla., supplies lights for the city and for private consumers at a price exceeding the cost; and at the end of the year, after taking out the reserve fund, interest, and other charges, it pays the balance of its profits back into the City Treasury to be applied in reducing taxes. Last year it paid over about $22,000. It charged $90 a year for a 2000-candle arc lamp, and for public buildings 7c. per kilowatt-hour. The cost of this plant was $228,700. The plant at Jamestown, furnishing 338 lights, cost $95,000; that at Grand Rapids, with 529 lights, $194,700; and that at St. Joseph, with 421 lights, $103,000.

The failure of the municipal gas plant at Philadelphia is referred to in Mr. Lacombe's report with the remark that, considering no reasons have been offered for the failure of this plant, it teaches no lesson. In Boston a contract has been made with the Company furnishing the light, which gives the City so much control of a portion of the plant that it is practically equivalent to, and comparable with, municipal ownership.

It was stated at the last meeting of the Stalybridge Town Council that the past year's working of the gas undertaking has been most successful. The loss by leakage was smaller than usual; and it is expected that a profit of something over £3000 will be shown, after the payment of interest on loans.

SAN PAULO GAS COMPANY, LIMITED.

Fourteen Candle Gas and Incandescent Lighting.

The Annual Meeting of this Company was held yesterday week, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox in the chair.

The Secretary (Mr. G. H. Rogers) having read the notice convening the meeting, the Directors' report and the statement of accounts, which were referred to in the "Journal" for March 31, were taken as read.

The Chairman said, in the first place, he must remind the shareholders that, when they met last year, he informed them of the negotiations that were then taking place with the Government of San Paulo for reducing the price of gas from 170 to 140 reis per cubic metre, with a lowering of the illuminating power from 17 to 14 sperm candles, because, with the introduction of the incandescent gas-burner, such rich gas was no longer required. The new contract was signed in February, 1902, and received the sanction of the Legislative Chambers in September last; but, by the terms of the contract, the price of gas was reduced to 140 reis per cubic metre to the private consumers as from March 1, 1902, while the illuminating power had to be maintained at 17 candles until all the public lamps had been converted to incandescent lighting—a work which was being rapidly proceeded with, and which it was expected to complete before the end of the current year. The illuminating power would then be lowered to 14 candles, and the price of gas for the public lighting would also be reduced to 140 reis per cubic metre—the same as the private lighting. The Company would then be able to effect considerable economy by dispensing with the use of cannel, of which above 10 per cent. of the total amount of coal carbonized was employed. The reduction in the price of gas with the extended use of the incandescent burner was giving the greatest satisfaction. The sale of gas to the private consumers for the year was 2,834,975 cubic metres, against 2,649,146 cubic metres for the previous year—an increase of only 2 per cent. The quantity sold to the private consumers during the ten months from March 1 to Dec. 31—that was, since the reduction in price was made—was 2,455,035 cubic metres; and had this amount of gas been consumed and charged at the old price of 170 reis per cubic metre, instead of at the reduced rate, the Company would have received an additional £8064, which sum fairly represented the benefit conferred upon the private consumers by granting the reduction. On the other hand, had the old price been maintained, the consumption would undoubtedly have been very much less. The reduction in price was not at first realized by the consumers; and the increase in the sale of gas had been gradual. But as a proof that the benefit conferred was now being fully appreciated, it was satisfactory to find that the sale of gas to the private consumers for December last was 237,612 cubic metres, against 185,080 cubic metres in the same month

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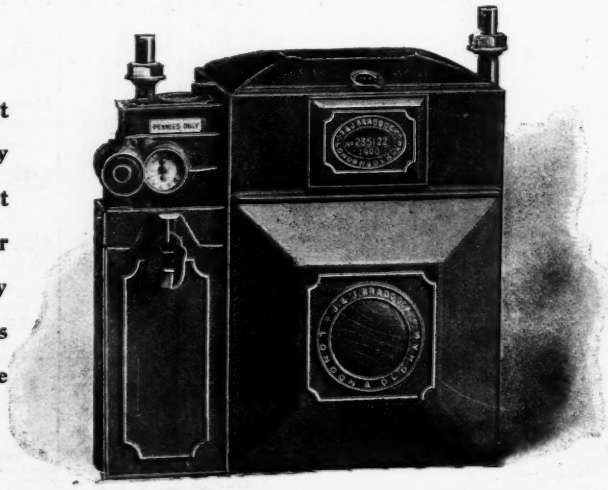

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of the previous year—showing an increase of 28 per cent. During the year, the number of public lamps had increased by 144, and the private consumers by 307. Bearing in mind the severe competition with the electric light, this result was highly gratifying; and it showed that the incandescent gas-light, properly looked after, gave more satisfactory results than the electric light. The Manager, in a recent letter, stated that the more humble class of residents in the city were now beginning to use gas more freely. The Company were taking steps to educate the people to the use of gas for heating and cooking; and, so far, the results were satisfactory, and encouraged the Board to look for a considerable development of the business from these sources. In order to ensure a uniform and sufficient pressure for the satisfactory use of the incandescent burner, a considerable enlargement and rearrangement of the mains had been necessary; and this work was being pushed forward as rapidly as possible. The new mains, with the heavy charge for duty on importing pipes into Brazil, and the conversion of the lamps, involved the Company in a considerable expenditure; but the satisfaction given, and the development of the business, confirmed the Directors in the opinion, formed when the matter was under consideration last year, that the outlay was a judicious one. The whole of the public lighting would be by the incandescent burner, which, in some of the principal positions, would be supplied with intensified gas. When the work was completed, it was believed San Paulo would be one of the best lighted cities in the world. There would be over five times the light given under the old system, at a reduction of more than 18 per cent. in the cost. As to the accounts, it was only necessary to point out that the decrease in the receipts for gas, notwithstanding the increased sale, was £2579—due entirely to the reduction in price, and that the products realized £1310 less, owing to the price of coke and tar falling. On the other side of the account, though 1386 tons more coal were carbonized, lower freights and prices had resulted in a saving of £1651 under this head. General charges were £1182 higher; and nearly £400 of this was due to exchange. Sundry smaller expenses accounted for the remainder of the difference. Finally, the net profit was £1799 less—a result highly satisfactory, when it was remembered, as he previously stated, that the reduction in the price of gas to the private consumers represented no less than £8064. Throughout the year, exchange had remained steady at about 12d. per milreis. The highest figure was 12$\frac{15}{32}$d., and the lowest 11$\frac{1}{4}$d. This firmness was a great advantage to the Company, as it avoided heavy fluctuations in the price of gas. When it was remembered that coal, iron, and everything used by the Company for the production and distribution of gas in San Paulo, owing to duty and other charges, cost more than double what they would in England, it was satisfactory indeed to be able to sell gas at prices varying from 5s. 8d. to 7s. 6d. per 1000 cubic feet—say 3d. per cubic metre—with results that should be pleasing both to the shareholders and the customers. With regard to the proposed new debenture issue, the Board thought it best to postpone it until they were able to fix definitely the amount required. The security was first-class; and no doubt the loan would be eagerly subscribed by the shareholders, to whom it would be offered preferentially. Referring to the proposed election of the Consulting Engineer (Mr. A. F. Phillips) to a seat on the Board, he said he was convinced the shareholders would unanimously agree to the proposal, as they would then have another guarantee that the affairs of the Company would be administered with efficiency. After a generous recognition of the services of the Manager in San Paulo (Mr. Richard Gray) and his staff, the Chairman formally moved the adoption of the report and accounts.

Mr. JOHN BARKER seconded the motion.

Mr. FOWLER, and later Mr. W. S. PARTRIDGE, spoke in support of the proposal to elect Mr. Phillips to the Board, seeing that he was very eligible for the position.

Mr. EDWARDS said he made out that altogether there was an increase in certain items of the expenditure equal to £3000; and in view of the reduction in the receipts by about £3000, an equivalent advance in expenditure appeared unsatisfactory. With regard to the balance-sheet, he saw the Directors were not writing off anything for depreciation; and it seemed desirable that something should be done in that way. As to the issue of further debentures, it appeared to him they could be raised at a smaller rate of interest than 5 per cent.

Mr. W. CASH asked, having regard to the cost, duty, and other charges on mains, whether Mr. Phillips had taken into consideration the question of increasing the pressure of the gas by means of fans.

Mr. PHILLIPS replied that, with the present system of mains in San Paulo, it would be impossible to adopt any pressure-raising fan system. They would have to have an independent main.

The CHAIRMAN added that some of the mains that were put in many years ago were now found to be defective; and they had to lay larger. Regarding the issue of debentures at 5 per cent. interest, they were going to be issued to the shareholders at par; and he had no doubt they would not object to receiving the little bit of profit which would attach to them. As to depreciation, they practically made provision for this in the item of repairs and renewals of mains, services, meters, &c. For these purposes alone, they spent no less than £6790 last year, and on repairs and maintenance of works £2613.

On the motion of the CHAIRMAN, seconded by Mr. J. R. TYNDALE, a dividend of 4 per cent. was declared (making 8 per cent. for the year), free of income-tax.

Proposed by the CHAIRMAN, and seconded by Mr. FOWLER, Mr. A. F. Phillips (who has been Consulting Engineer to the Company for nine years past) was elected a member of the Board; and on the motion of the CHAIRMAN, seconded by Major H. N. WEBB, the retiring Director (Mr. John Barker) was re-elected.

The Auditors (Messrs. Cash, Stone, and Co.) having been re-appointed,

The usual complimentary votes were passed; and with them the proceedings ended.

Mr. C. F. H. Leslie has been elected a Director of the West Ham Gas Company.

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C. & W. WALKER, LIMITED.

The Fifth Annual General Meeting of this Company was held at Birmingham, on Monday of last week, under the presidency of Mr. W. Perrott. The Chairman, in moving the adoption of the report and balance-sheet (which were noticed in the "JOURNAL" for the 17th ult., p. 718), remarked upon the fact that the past year had not been an ideal one for manufacturing companies; and though they had fallen short of the profits of the previous twelvemonth, which was an exceptional year, they had full confidence in coming before the shareholders, for, as they approached very nearly to the profits of last year, they had every reason to congratulate themselves on the result. It would be seen that they had carried £10,000 to the reserve fund, instead of dividing it between reserve and goodwill. He knew there was a feeling among some of the shareholders that the goodwill should be wiped out altogether; while others thought that it would be unwise to interfere further with such a small amount. The Directors believed it would be in accordance with the general opinion of the shareholders if they did not further reduce it, for the reason that the money they had placed to goodwill they had no further control over, whereas the reserve fund which it was proposed to build up would be entirely under the control of the shareholders. He referred with satisfaction to the fact that the whole of the mortgage debentures had been cleared away; so that they had a concern representing 40,000 preference shares and 40,000 ordinary shares, without any extra charge whatever. The balance from last year was £6147, against £3000 the year before; and, though they had made slightly less profit, they had, with the amount brought forward, a larger total to deal with, and they carried forward nearly £1000 more. They started this year with a balance of £7548; and their prospects were satisfactory. The report was adopted.

GAS v. ELECTRICITY IN PADDINGTON.

Dissatisfaction with the Electric Lighting in Westbourne Terrace.

At the Meeting of Paddington Borough Council last Tuesday, the Lighting Committee reported that the Surveyor had, in accordance with instructions, prepared and submitted information upon the gas and electric lighting in the borough. The Committee recommended that the lighting question be referred to a Joint Committee consisting of the members of the Works and Lighting Committees. Colonel Blair, in moving the adoption of the recommendation, said there had been numerous complaints of insufficient lighting; but, on the other hand, it was to be remembered that the lighting of Paddington only cost £148 per mile, while adjoining districts paid from £350 to £500 per mile. The electric lighting in Westbourne Terrace—the only place where it had been tried in Paddington—cost £900 per mile. What was wanted was the adoption of some system whereby more light could be given where there was the greatest traffic. The recommendation was agreed to.

There was a long discussion upon another recommendation of the same Committee—"That notice be given to the Metropolitan Electric Supply Company, Limited, that the lighting of Westbourne Terrace by electricity will be discontinued as from a date to be fixed within the next three months." Colonel Turner, in moving that the recommendation be referred back to the Committee, contended that the step was a retrograde one. He said no one ever claimed for electricity that it was a cheap illuminant. Mr. Blackwood said the electric light was installed in Westbourne Terrace four years ago as an experiment; and they had now had enough of it. Colonel Blair explained that the Committee only desired to clear the ground by this recommendation. They were not committed to gas; and personally he was in favour of electric lighting for the omnibus routes. Only eight members voted for the reference back, which was accordingly negatived. The Committee's recommendation was then carried.

ANTWERP WATER-WORKS COMPANY, LIMITED.

The Annual Meeting of this Company was held on Monday, March 30, at the Cannon Street Hotel, E.C. The notice convening the meeting was read by the Secretary (Mr. J. M. Hamilton); and then the report and accounts were submitted. The former showed that the income, from all sources, amounted to £50,542, as compared with £47,987 for 1901; and after deducting working expenses, the cost of laying on services, and London expenses, there was a balance of £33,494. To this sum was added the undivided profit of £258 brought forward, and interest on investments £543; making a total credit of £34,296. Against this had been charged debenture interest and income-tax for 1902; the contribution to the reserve fund of 5 per cent. on the net profits; discount and commission on debentures, £63; the interim dividend of £9000, at the rate of 6 per cent. per annum; the transfer to the sinking fund for the redemption of debentures of £800, and for that of the share capital, £6250; and the Directors' extra remuneration under Article 118 of £644. Out of the remaining £12,598, the Directors recommended a balance dividend for the six months to Dec. 31 at the rate of 7 per cent. per annum, free of income-tax, absorbing £10,500, and making a total dividend of 6½ per cent. for the year. The amount to be carried forward would then be £2098. The Board reported the death of Mr. H. G. H. Norman, who was one of the original Directors of the Company, and the election of Mr. W. H. Blaber to fill the vacancy. The Directors further mentioned that they had transferred £5000 from reserve to form the nucleus of a sinking fund for the redemption of the debentures as from Jan. 1, 1902; and they

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would, subject to any increase in the debenture issue, set aside annually £800, which, at 3½ per cent. compound interest, would be sufficient to redeem the present debenture issue at the expiration of the concession. At the request of the Chairman (Mr. William Blaber), Mr. Easton Devonshire, Assoc.M.Inst.C.E., presided; and, in moving the adoption of the report and accounts and the declaration of the dividend, he enlarged upon the matters mentioned in the report—expressing first the satisfaction he felt, on the first occasion on which he occupied the chair, at having such an excellent report to submit. The Manager's report showed that the progress of the undertaking was a very sound one, and that the number of contracts had been increasing from year to year for some years past. This was not often the case in a water company so old-established as theirs. But fortunately the business was in a city of progress; and they had before them a very large scope indeed for the extension of the undertaking. There were in Antwerp some 45,000 houses; and, although the Company had reached the stage of paying substantial and regular dividends, they were only supplying of that total some 12,500 houses. This was satisfactory in one respect, that the shareholders could anticipate an increasing prosperity for some years to come—in fact, until the day the property was acquired by the city, either by purchase or by the expiration of the concession. The Directors had made sound provision against that day. The insurance of the sinking fund for the full amount of the share capital secured the return of £20 per share at the end of the concession in 1931. Should, however, the city authorities decide to exercise their right of purchase in 1911, they would have to pay the Company twenty years' purchase of the average profits of the previous five years. This, as the business was going now, would be a good basis; and the surrender value of the policy of insurance would be a large one—he believed £67,800—at that time. The unexpected and rapid increase of consumers, and consequently of the water supplied, had necessitated an extension of their pumping plant. This they proposed to put down in the neighbourhood of the city; and the capital outlay in view was about £30,000. Commenting on the new sinking fund (mentioned in the report) for the redemption of the debentures, he said they had now to set aside annually £800 for the redemption of the existing debentures at the end of the concession; and this sum would, of course, have to be increased to redeem the further issue of debentures. It was in consequence of this additional charge upon the revenue, that the Directors deemed wise to carry forward the substantial balance they had of £2098. The motion was seconded by Mr. Blaber, and unanimously agreed to. After the formal business had been transacted, the Manager (Mr. Ad. Kemna) gave the shareholders some information as to the progress of the business, and the experimental steps about to be taken to secure an even larger increase.

An installation of electric lighting in a grocery establishment at Dunfermline, which cost £400 to put in and requires an annual expenditure of £75 for maintenance, is to be replaced by high-pressure gas lighting by the James Keith and Blackman Company, Limited.

WOLVERHAMPTON CORPORATION WATER SUPPLY.

Local Government Board Inquiry—Agreement with Colonel Kenyon-Slaney.

At the Town Hall, Wolverhampton, last Tuesday, Mr. W. O. E. MEADE-KING held an inquiry in regard to an application made to the Local Government Board by the Corporation for a Provisional Order to partially repeal, alter, or amend the Local Improvement Act of 1869, or any Act or Order amending it, so as to make further provision in regard to the water undertaking of the Corporation. Among other concessions which the Corporation required were powers to enable them to pay compensation to Colonel Kenyon-Slaney, M.P., for damage or loss caused by the operations at the pumping-station at Cosford; and also to obtain facilities for the carriage of coals to the station, to enable them to construct additional service reservoirs in the parishes of Tettenhall and Sedgley, adjoining those now existing, lay mains within and beyond their district, supply water in bulk outside the borough, refuse to supply more than one house by means of one pipe, make provision for the protection of meters, &c., extend their borrowing powers, and increase the limit of their reserve fund. Among those present were the Chairman of the Water Committee (Alderman J. Marston), and the Water Engineer (Mr. E. A. B. Woodward, Assoc.M.Inst.C.E.).

The TOWN CLERK (Mr. Horatio Brevitt) opened the proceedings by stating the reasons why the Corporation had found it necessary to enter into the agreement with Colonel Kenyon-Slaney. The Corporation were the successors of a Water Company, whose undertaking at Cosford they acquired in 1867. The pumping-station adjoined the estate of Colonel Kenyon-Slaney, and for twenty years there had been correspondence with him, as, since the Corporation had sunk their wells deeper, he had complained of the damage that was being done to his estate through his surface and underground water being drained off. He had raised the legal question that the Corporation had no right to do what they were doing; but the Water Committee of the Corporation, from the outset, had objected to enter into the controversy. The Corporation had had to consult experts, with a view of getting a supplemental water supply, as there was only a small margin between the supply and the demand, inasmuch as the water limits extended much beyond the area of the borough itself. When the Corporation promoted the Bill two years ago for the sinking of two wells at Stableford and Hilton, Colonel Kenyon-Slaney placed his grievances before the House of Commons, and the Bill was rejected. It was decided to promote a similar Bill in the ensuing session, and it passed into Committee. In the course of an interview, Colonel Kenyon-Slaney said he should require £10,000 for past injuries; and it was stated that it must be an individual payment, and that it would not prevent the Colonel offering opposition to the Bill. The Chairman of the Water Committee agreed that the sum should be paid; but, after some witnesses had been called, the preamble of the Bill was not

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proved. There was afterwards an outcry in Wolverhampton at such a sum having been promised. The matter came before the Town Council, who thought their credit had been pledged, and an agreement had been signed by which the Council were to pay the sum mentioned. For this Colonel Kenyon-Slaney had, however, granted concessions for the sale of land, and, under the arrangement with him, an aerial tramway would be erected for the conveyance of coal from Ruckley siding to Cosford. The siding belonged to Colonel Kenyon-Slaney; and unless the lease were renewed, the Corporation would have to pay a heavier sum for the carting of coal. The cost at present was £756 per annum, and it was expected that a saving of £130 a year would be effected. There would also be a saving of £60 a year paid for the wear and tear of the road by the extra traffic. When the various sums were capitalized, the Corporation would get a bargain of £6000, and a further saving of £4500 would be effected by the construction of a new siding. The town would, therefore, get an equivalent of £10,500 for the £10,000 to be paid. If, through the opposition, the agreement did not become operative, it would be a disastrous thing for Wolverhampton.

Alderman *Marston* then gave evidence in support of the application, and, in answer to questions, said he did not know that what was once boggy land on Colonel Kenyon-Slaney's estate was now sound pasture land owing to the pumping operations. The Colonel had given proof of damage before Parliament, and the consequence was that the Bill of the Corporation was thrown out.

The Town Clerk read a statement showing that the damage amounted to £575 10s. per annum, and that the total damage had reached £20,000.

Mr. *Woodward* having given evidence showing that it would be advantageous to enter into the proposed agreement,

Mr. C. Boyes opened the case for the opposition. He said that 90 per cent. of the ratepayers were opposed to the payment to Colonel Kenyon-Slaney, on the ground that it was unjust.

Several witnesses having spoken against the proposed payment,

The Town Clerk pointed out that the water undertaking of the borough had not cost the ratepayers a penny, while, on the other hand, £27,000 had been paid from it in relief of the rates.

This concluded the arguments in regard to the agreement, and the Town Clerk proceeded to explain the other matters which the Corporation asked to be inserted in the Order. Before the inquiry closed, a letter was handed in from a land valuer, which stated that the damage done to Colonel Kenyon-Slaney's estate at Hatton Grange was £20,000. The letter was taken possession of by the Inspector.

The Fenton Urban District Council have accepted the tender of Messrs. Newton, Chambers, and Co., Limited, for four purifiers on Green's system, and a new purifier-house, to be erected from plans and specifications prepared by the Manager (Mr. R. Surtees).

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There was an unfortunate mishap at the half-yearly meeting of the Waverley Association of Gas Managers at Penicuik last Thursday, in the absence of the retiring President, Mr. Laurence Bell, late Gas Manager at Innerleithen. As is well known, Mr. Bell has ceased to be gas manager, and has become engineer and manufacturer of motor cars. I understand that he has had constructed a huge car, capable of carrying 60 persons, which is to be used during the summer season in pleasure runs from the Hydropathic at Peebles. It was doubtless the fear of this mammoth car breaking down while on a run with Easter visitors, and not being repaired in time for the rest of the present holiday season, which was the occasion of the refusal to allow Mr. Bell to leave the locality for even a few hours. There was the expectation that he would have had more information to give regarding the installation of incandescent gas lighting in Innerleithen mills; but in this, too, the members were disappointed. It was Mr. Bell's intention, instead of writing an address, to deliver an oral speech, so busy has he been; and his detention thus resulted in a double blow to the meeting—his own absence and that of his paper. There was much regret expressed at Mr. Bell not being able to take up his duties, and much sympathy with him on account of the unforeseen nature of the cause. His father is one of the veterans among gas managers. This was the third occasion, at least, upon which he took the place, at the Waverley Association, of an absent President. He is worthy of all credit for these manifestations of unselfishness of spirit. On this occasion, he is all the more so in that he was very ill when he took the chair. He has his reward in the successful meeting which he carried through. There were helping hands, who prevented the business from flagging, and to whom the Association are under a debt of gratitude for their efforts to retrieve a situation which, in a less elastic body, would have been looked upon as hopeless. Mr. Ewing and Mr. Wilson both placed excellent matter before the meeting, albeit they each spoke without preparation, and with no figures in their hands to support their statements. They came to the feast, and became the hosts. I do not leave Mr. O'Connor out of view, because I have this remark to make of him—that he is a very frequent speaker at the Waverley meetings, and always contributes good matter. What is in my mind in this connection is that Mr. O'Connor is a trader—he said as much in his opening sentence on this occasion—yet he is welcomed at the Waverley meetings. This is solely because his remarks are useful to the members. It would, I dare say, be going too far to draw an analogy from this with reference to the toleration of traders as speakers at the meetings of other bodies, because everyone is not an O'Connor But it is worthy of recording that, through the instrumentality of the liberal spirit which pervades the Waverley Association, Mr. O'Connor is able to express views which have been helpful to many outside as well as to those

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inside the Association. The meeting this spring, though conducted under difficulties, is one of which there will be no regrets, but rather pleasant memories—not solely on account of what was said and done at the meeting proper, but also because of the very enjoyable excursion which followed, in the course of which a visit was paid to the handsomely equipped and preserved works of the Company, and to the far-famed chapel of Roslin.

It is well known that the Corporation of Edinburgh have all along pursued a parsimonious policy with reference to street lighting by gas, while since the introduction of electric lighting their provision of it has been most prodigal. Latterly they have been prodded on by various bodies to make an effort to bring the public lighting of the city somewhat into line with what prevails in many places of much less importance or pretension. As the outcome of this movement, a report upon the subject of street lighting has been prepared by Mr. G. A. D. Mackay, the Inspector of Lightir g. I give copious extracts from the report, which, I fear, will not greatly enhance the reputation of the lighting authority in the city. Mr. Mackay says that, whatever the merits of incandescent gas lighting may be, it is not well adapted for thoroughfares or places with heavy traffic. It is more successful in quiet and sheltered localities, as these give immunity from excessive vibration, and, as a consequence, a longer lease of life to the respective mantles. It is desirable, so far as possible, that lamps with incandescent burners should form one continuous stretch, and not be sandwiched at intervals between the ordinary gas-lamps; the arrangement suggested permitting of the incandescent lamps being attended to by the men who have had special training for the work. Shortly after Mr. Herring took office, it is pointed out, a new burner emitting a broad soft flame was, on his recommendation, introduced as an improvement into the ordinary gas-lamp. It had, however, to be discarded on the ground that, with the slightest movement of the atmosphere, there followed an emission of smoke, which resulted in the darkening of the globe, thus rendering the light absolutely ineffective. It has been suggested by some enthusiasts in lighting that the present ordinary gas-lamps should be superseded by incandescent gas-lamps, or even that the electric arc lamps might be utilized to cover the entire lighting requirements of the city. It seems, however, that the authors of the suggestions have not fully grasped their financial significance. Mr. Mackay gives information to show the cost that would be nvolved in the transformation. Were the present ordinary gas-lamps displaced by incandescent lamps consuming 3 cubic feet of gas per hour, the excess cost for the first year would be £27,413, and the annual increase thereafter £7300; if by incandescent lamps consuming 4 cubic feet, the excess cost for the first year would be £32,695, and the annual increase thereafter £12,575. Were the whole city lighted by electric arc lamps, 3791 lamps would be required, the expenditure on which would be £49,283, or an increase of about £20,000 per annum on the present expenditure. Should the Committee see their way to recommend further lighting extensions, the Inspector suggests that those portions of the main thoroughfares and street-car routes still unlighted by electricity should, on the ground of public safety, have the first consideration. Should ordinary gas lighting be further displaced by the introduction of incandescent gas-lamps, it is desirable that the localities to be first adopted for the change should be the side streets in the centre of the city, and that progress in this direction be made outwards therefrom. The work, if desired, could be carried out by instalments; the Committee indicating how and when it was to be completed. The report directs attention to the illuminating power of the different lighting methods, on the ground that, in relation to expenditure, this is of primary importance. For comparative purposes, the average arc lamp is taken as of 800-candle power. Every electric lamp introduced for street lighting displaces, on an average, 3½ gas-lamps; so that the two units of comparison are, on the one hand, the electric lamp, and, on the other, 3½ gas-lamps taken together and regarded as a whole. The following table is given:—

Lighting Methods.	Cost per Annum.	Candle Power.
Electric lamp	£13 0 0	.. 800
Ordinary gas-lamp (2 cubic feet) .	5 12 6	.. 28
Crescent (4 cubic feet)	9 5 6	.. 63
Incandescent (3 cubic feet) . . .	8 3 3	.. 315
Incandescent (4 cubic feet) . . .	10 0 0	.. 385

I have several times called attention to the treatment which is meted out to municipalities by auditors who are appointed by the Secretary for Scotland over burgh accounts. Sometimes it looks to municipal authorities to be rather on the cavalier side; and there have been several indications of a disposition on the part of those who felt themselves harassed to protest—a movement which is reminiscent, so far as it has gone, of the turning of the worm. Now there is more combined action on foot than has yet been attempted to deal with the subject. This week the Convention of Burghs has held its annual meetings in Edinburgh; and among the business transacted was a remit to the Annual Committee to procure a return from the burghs of questions which have arisen between them and their auditors, and to report, with a view to obtaining uniformity in the method of dealing with such questions. Perhaps in combination the burghs may be able to check the disposition on the part of auditors to ride on the top of their commission, which individually they have been unable to do.

Drowned in a Gasholder Tank.—An inquest was held at Morecambe, on the 4th inst., on Richard Howarth, of Overden, Halifax, who was found drowned in the gasholder tank at the Morecambe Gas-Works. Deceased had been engaged in resetting some retorts; and he told a fellow-workman that he had received a communication from his employers which meant dismissal. This preyed on his mind. Next day he said he was better dead than alive. A verdict of "Found drowned" was returned.

SO GLAD!!!

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HOT COKE CARRIER

will be universally adopted in

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Our Furnaces and Installations of Inclined Retorts have always been made a success, and our Patent Shot-pouch method of charging is the most Automatic System.

ADDRESS:

NEW CONVEYOR COMPANY, LIMITED,

SMETHWICK.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 9.

Sulphate of Ammonia.

The market has been quiet throughout the week; and prices have been barely maintained. The closing quotations were £13 5s. per ton f.o.b. Hull, £13 7s. 6d. per ton f.o.b. Liverpool, and £13 10s. to £13 12s. 6d. per ton f.o.b. Leith. There has also been less disposition to purchase for April-May delivery; but in some cases full prices have been paid in this position. For delivery further ahead, buyers are still indifferent, and no important business has transpired.

Nitrate of Soda.

This is a strong market; and prices have been advanced to 9s. 4½d. per cwt. for ordinary, and 9s. 7½d. for refined quality.

LONDON, *April* 9.

Tar Products.

Business generally is very quiet, doubtless owing to the approach of the holidays. There is no business whatever doing in pitch for prompt delivery, and consumers will only purchase forward at a reduction in value. Small quantities of 90 per cent. benzol have been sold at outports at 9d.; while in 50-90's 7½d. has been accepted for a further quantity, April-May delivery. Solvent and toluol remain in the same position. There is absolutely no business doing in the articles. In crude carbolic a very large business has been done at 1s. 6d. for April-May; while it is reported that a considerable quantity has been placed at 1s. 7d. for July-December. Creosote continues in very good demand, but prices are unchanged.

The average values during the week were: Tar, 22s. 6d. to 28s.; pitch, London, 58s., east coast, 55s.; benzol, 90 per cent., 9d.; benzol, 50-90 per cent., 7½d.; toluol, 7d.; crude naphtha, 3d.; solvent naphtha, 8d. to 9d.; heavy naphtha, 9d.; creosote, London, 1½d. to 1⅝d., North, 1¼d. to 1⅜d.; heavy oils, 2⅛d.; carbolic acid, 60 per cent., 1s. 6d.; naphthalene, 35s. to 55s., salts, 22s. 6d. to 25s.; anthracene, "A" quality, 1⅜d. to 1¾d., "B" quality, 1d. nominal.

Sulphate of Ammonia.

There is no alteration to report; but very little business is doing. The Gaslight and Coke Company are not offering, while another London Gas Company ask £13 15s. for prompt. In Hull, business has been done at £13 10s. for prompt shipment; but consumers will not pay this price forward. In Leith, there is no business to report. Makers are still asking £13 12s. 6d. In Liverpool, some small sales have been made at £13 10s., but only for prompt delivery.

Messrs. Joseph Taylor & Co., of Bolton, have in hand for the Jersey Gas Company, St. Helier's, a 1½-inch solid-plate lead saturator, with 2-inch bottom, fitted with double detachable ammonia pipes, also with detachable acid pipe and steam pipe.

COAL TRADE REPORTS.

Lancashire Coal Trade.

For the time being, prices generally throughout Lancashire are being fairly well maintained. The downward movement in other districts and isolated reductions by Lancashire collieries have, however, compelled the question of prices to be brought forward for consideration at a special meeting of the Lancashire Coal Sales Association, which has been held during the week. The proceedings of this meeting have been kept private; but we understand that among the matters discussed were the forthcoming locomotive fuel and gas coal contracts, as to which the recent tendency of the market has indicated the possibility of some concessions upon last year's figures. With regard to the general question of round coal prices, we learn that, except a sort of official confirmation of the reductions which during the last month have already come into pretty general operation in the Liverpool district, any further alteration in quoted list rates was deferred until a further meeting of the Association, which is to be held on the 28th inst. This would mean that any general reduction in prices would not come into operation until the close of the month; but in many quarters there is a strong feeling that the increasing competition of lower prices in other districts, and the reduced rates already being quoted by one or two of the Lancashire collieries, may necessitate some modification of prices towards the middle of the month. The Easter Holiday stoppages of the pits—which in many cases have extended over three or four days—have brought forward during the past week perhaps some extra inquiries to carry consumers over; but, apart from this, there is no real improvement in the demand. Up to the holiday stoppages, pits have perhaps got on to pretty near full time; and generally the output has been moving away. There is, however, a good deal of irregularity in round coal prices, owing to the low quotations at which supplies from outside districts are being offered. At the pit, best Wigan Arley coals are only in special cases fetching 15s. per ton, the average prices being more nearly 14s. to 14s. 6d., with seconds Arley and Pemberton four-feet coals averaging about 12s. 6d. to 13s., and common house-fire sorts 10s. to 11s. In the lower descriptions of round coal, the market has perhaps shown rather a steadier tone. Inland requirements, owing to increasing activity in some of the industrial branches of trade, are showing some enlargement; and shipping requirements have also slightly improved. As a result, for the moment there is some firmness in prices. On inland sales, it is exceptional where under 8s. 3d. to 8s. 9d. and 9s. is being quoted at the pit; while for good qualities of steam coals, delivered at the ports on the Mersey, from 9s. 9d. to 10s. 3d. is being obtained. Engine qualities of fuel are fully maintaining the strong hardening tendency reported of late. Although there is no actually official advance in prices, collieries on new business have no difficulty in getting 3d. to 6d. per ton upon late rates, and, in fact, are quite indifferent about booking new orders beyond the requirements of their regular

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Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

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THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

customers. At the pit, best slacks are fetching 6s. 9d. to 7s. 3d. per ton, medium sorts 5s. 9d. to 6s. 3d., and common slack 4s. 6d. to 5s. All descriptions of coke are very strong at full rates.

Northern Coal Trade.

The interruption of the holidays has affected the coal trade in two ways—it increased a little the demand to provide stock, and it is lessening the output. In the last few days, there has been a larger production, though not to the full extent of the facilities. In the steam coal trade, there is a steady inquiry, and a little continues to be sent to the United States. Best Northumbrian steam coals are 10s. per ton f.o.b., second-class steams are 8s. 9d. to 9s., and steam smalls are 5s 6d. to 5s. 9d.—the latter kind being still rather scarce. In gas coals, the quantities delivered to the great consuming companies now show a further falling off; and hence the supply is more than adequate to the requirements. The current quotations vary from 8s. 3d. to 8s. 9d. per ton f.o.b., according to the quality; and there should be soon an increased export. One or two contracts have been settled for gas coals of late. But the quantities are not very heavy; and where the prices are declared, they show a slight fall from those for the previous contracts. It is rather difficult to ascertain what are the likely prices for the greater contracts impending; but they are also likely to be lower than their predecessors. Gas coke is now less plentiful, owing to the reduced production; the price being from 12s. 3d. to 12s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There is a little more activity this week, due to the already partial opening of the Baltic ports. But trade is still very stiff generally, with, in many instances, difficulty in getting outputs disposed of. The prices quoted are: Main 8s. to 8s. 3d. per ton f.o.b. Glasgow, ell 9s. to 10s., and splint 9s. 6d. to 9s. 9d. The shipments for the week amounted to 208,566 tons—a decrease of 2414 tons upon the previous week, but an increase of 12,810 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,451,149 tons—an increase of 89,647 tons upon the corresponding period of last year.

Explosion of a Gas-Engine.—On Thursday last a serious accident happened in Messrs. Dunsmuir and Jackson's engineering works, Govan. The explosion chamber of a 70-horse power gas-engine burst, and the side of the engine-house was blown out. So great was the force of the explosion that a number of corrugated iron sheets were carried for a distance of about a dozen yards. John Brolley (32), engineman, who was at the engine, was thrown heavily to the ground; while William Robertson (38), machineman, who was working a boring machine a short distance away, was struck on the head, and sustained a serious scalp wound. Brolley, who was suffering from gas poisoning and severe shock, was removed to the Western Infirmary. Robertson was, however, taken home.

Dartmouth Gas Company.—The accounts submitted at the annual meeting of this Company last Tuesday week showed that the receipts amounted to £4455, which was an increase over those for the previous year, though there had been a reduction of 3d. per 1000 cubic feet in the price of gas. The expenditure was £3857, and the profit balance £598. A dividend was recommended of 9s. per share, on which £6 10s. is paid up. Mr. R. W. Prideaux, the Chairman of the Company, who presided, said the position of the undertaking was satisfactory, but the Directors had decided to carry forward a good balance, in order to provide for further prepayment meters, and also to meet the competition of the electric light. The report and accounts were adopted.

London County Council and Sunday Gas Testing.—The report of the Public Control Committee of the London County Council on the subject of testing gas on Sundays which was given in the "JOURNAL" for the 31st ult. (p. 844) did not come on for consideration at the meeting of the Council on that day; Mr. R. M. Beachcroft having opposed its reception. He subsequently withdrew his opposition, and at last Tuesday's meeting the Committee's recommendation—that the gas supplied by the Gaslight and Coke and Commercial Gas Companies should continue to be tested on Sundays and Bank Holidays at the prescribed testing-places, pending a decision in the action that has already been commenced against the South Metropolitan Gas Company, or for a period not exceeding three months, at an estimated cost of £115—was approved.

A Big Leakage at Cromer.—The accounts of the Cromer Gas Company for the year ending Dec. 31 show a profit of £1544, as against £1763 for the preceding twelve months. Out of this the Directors recommended a dividend of 1 per cent., less income-tax (making 2½ per cent. for the year). There was a satisfactory increase in the sale of gas in the early part of the year; but this was not maintained in the summer quarters—the increase over the whole of the year being under 5 per cent., which only just covered the loss in income caused by the reduction in the price of gas, while, on the other hand, the expense on works and distribution was heavier than in the preceding year. The carbonizing results, both in make and fuel consumption, were satisfactory; and a substantial sum was realized as a result of the erection of the sulphate plant. At the meeting of shareholders, Mr. Church drew attention to the huge capital of the Company and the high percentage of unaccounted-for gas. The latter item worked out to over 13 per cent.; and this, coupled with the enormous capital, was, in his opinion, the cause of the unsatisfactory nature of the report. The capital worked out at over £19 per ton of coal carbonized. Mr. Percy Griffith, the Consulting Engineer, said that it was he who had recommended the increase of capital which had taken place; and he was certain that, having regard to the prospects of the Company, he was justified. The question of leakage was being considered; and he should be very surprised if it remained so high over another quarter. The report was adopted.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000		

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . 1,800,000 Cub. Ft.

Damage to Roads by Diversion of Traffic.—Some weeks ago, the Bermondsey Borough Council asked the support of all the other Metropolitan Borough Councils to the following resolution: "That the London County Council be requested to include in their next General Powers Bill a clause making it compulsory on the part of any electric light, gas, water, or other company or persons, to pay for the damage done to any road or street into which traffic has been diverted in consequence of the road in which they have been at work being too narrow to allow of the traffic passing at the same time." At the meeting of the Council last Tuesday, it was reported that fifteen Councils supported the resolution, eight decided to take no action, and three merely acknowledged the receipt of the communication.

Public Lighting of Blackpool.—In the course of a sitting of the Blackpool Town Council occupying five hours last Tuesday, Alderman Mather, as Chairman of the Markets and Street Lighting Committee, drew attention to the enormous cost of lighting the town. Brighton, with a population of 120,000, spent £11,800; Great Yarmouth, £3900; Eastbourne, £3216; Southport, which was very similar to Blackpool, and had a larger street area, £4560; and Scarborough, £4089. Blackpool spent nearly four times as much as the latter towns—the amount last year being £11,903. The cost in Blackpool in 1897 was £5945; so that the expense of public lighting had doubled since that time. One street, which was electrically lighted, cost £130 a year; whereas another, which was of similar length but was lighted by gas, cost £32. He called attention to the advantages of lighting streets with intensified gas, citing the case of Whitworth Street, Manchester, where the cost was only 1¾d. per lamp per hour. Blackpool was undoubtedly the best-lighted town in the kingdom, as was remarked by everybody; but it was time they tried to economize. An amendment that the minute authorizing the shutting off of all the street lamps two hours before sunrise should be referred back was lost. A further amendment, that the street lighting be not shut off at Easter, as was proposed, was, however, passed.

Gas Profits in Blackpool and Warrington.—At the meeting of the Blackpool Town Council last Tuesday, Mr. J. Battersby, in moving the acceptance of the minutes of the Gas Committee, incidentally mentioned that the net profits on the undertaking for the past financial year were £13,000. A local paper, referring to the matter, says: "Once again the Gas Department of the Corporation has exceeded expectations. Thanks to the excellent management of Mr. J. Chew and his son (Mr. W. Chew) the net profits of the past year's working amount to no less than £13,000, after making provision for interest and sinking fund. This is a very solid increase upon last year's profit of £11,045, and a big advance upon the estimate of £9500, which was carefully made because of the increasing interest charges to come against the funds on account of the new capital expenditure on extensions. Another valuable comparison is that while last year the results fell short of the estimate by £1500, this year we have an excess of £3500. We are now enjoying the first-fruits of the extensions and the introduction of modern machinery and plant. The increase is in no way affected by the coal market; but in this handsome saving of a sum equal to 8d. in the pound—2d. more than was calculated in the estimate—the main factor is undoubtedly the foresight and business management of Messrs. Chew." On the same day, the Gas Committee of the Warrington Corporation reported that they would be able to provide a sum of £4000 in relief of the rates for the ensuing year; being an increase of £2000 upon the grant made by the Committee twelve months ago.

Plymouth Gas Company's Bill.—At a meeting of the Plymouth Town Council yesterday week, Mr. A. G. Crowle asked why the Corporation did not oppose the Bill of the Plymouth and Stonehouse Gas Company, by which authority was given to the Company to reduce the illuminating power of the gas from 15 to 14 candles. The Town Clerk replied that they were advised that it was undesirable to oppose, and that it would be a waste of time and money to do so. No expert witness of repute could be found to say it was an undesirable thing to lower the illuminating power to 14 candles. The case of the South Metropolitan Gas Company had set a precedent which they could not ignore. Therefore, instead of employing expensive witnesses in opposition which was likely to prove fruitless, it was thought better to confer with the Company; and this had been done. The Company had undertaken to supply free, within twelve months, burners suitable for gas of lower candle power. As regards the opposition to the Bill generally, the Corporation had consulted experts, and, as the result, had decided to keep the money in their pockets. The question of the extension of the Company's mains to Plymstock, for which authority is sought in the Bill, was on the same day referred to at a meeting of the Plymstock Parish Council. In reply to a communication from the Council, the Secretary to the Company (Mr. H. B. Heath) wrote that the Directors were anxious to supply gas to the villages in the parish, and would do so at the earliest date if they found sufficient encouragement to warrant the outlay. A canvas would be made; and if it was found that a supply could be furnished with a reasonable prospect of covering the expense, it would be laid on.

The District Councils of Sowerby Bridge and Oldbury have reduced the price of gas 2d. per 1000 cubic feet, and in the case of the latter Council 3d. per 1000 cubic feet when used for motive power.

The Directors of the Buenos Ayres (New) Gas Company, Limited, recommend the payment of a final dividend of 8s. per share, free of income-tax, for the half year ended Dec. 31 (making with the interim dividend already paid 7 per cent. for the year), placing £10,000 to the reserve, and carrying forward £10,811 10s. 5d.

Mr. Bertram Blount announces that owing to the death of his partner, Mr. W. Harry Stanger, the firm of Messrs. Stanger and Blount is dissolved. The business of the late firm is being temporarily conducted at No. 2, Broadway, Westminster; but at an early date Mr. Blount will remove to other premises in Westminster.

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Business for Disposal.

GREENALL'S METER SYNDICATE. Close, Leeds.

Plant, &c., for Sale.

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RETORTS. Shipley Gas-Works.
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Plant (Second-Hand) Wanted.

EXHAUSTER. Gas Company, Ceres, N.B.

Meetings of Companies.

IMPERIAL CONTINENTAL GAS ASSOCIATION. May 5.

Sales of Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. April 21.
BRIGHTON AND HOVE GAS COMPANY. April 28.
DOVER GAS COMPANY. April 28.
GAS-METER COMPANY. April 28.
HORLEY GAS COMPANY. April 28.
ILFORD GAS COMPANY. April 28.
NEWCASTLE AND GATESHEAD GAS COMPANY. April 21.
SOUTH ESSEX WATER-WORKS COMPANY. April 21.
TONBRIDGE GAS COMPANY. April 21.
WEST KENT GAS COMPANY. April 21.
YORK UNITED GAS LIGHT COMPANY. April 27.

Mortgage Bonds.

SOUTH SHIELDS GAS COMPANY.

TENDERS FOR

Boiler House (Building).

ILFORD GAS COMPANY. Tenders by April 28.

Boilers.

BANGOR DISTRICT COUNCIL. Tenders by April 20.
ILFORD GAS COMPANY. Tenders by April 28.

Brass Fittings, Valves, Lead Pipe, &c.

DEVONPORT GAS DEPARTMENT. Tenders by April 30.
WALLASEY CORPORATION. Tenders by May 9.

Coal and Cannel.

BARNOLDSWICK GAS DEPARTMENT. Tenders by May 1.
BODMIN GAS COMPANY. Tenders by May 4.
BRENTWOOD GAS COMPANY. Tenders by May 1.
DEVONPORT GAS DEPARTMENT. Tenders by May 9.
LONGFORD GAS COMPANY. Tenders by April 23.
MORECAMBE GAS DEPARTMENT. Tenders by May 4.
WALLASEY CORPORATION. Tenders by May 9.

Condensers.

BALLINASLOE GAS DEPARTMENT. Tenders by April 20.

Engines (Gas and Steam).

BANGOR DISTRICT COUNCIL. Tenders by April 20.
LONGFORD GAS COMPANY. Tenders by April 23.

Exhauster.

LONGFORD GAS COMPANY. Tenders by April 23.

Fire-Clay Goods.

DEVONPORT GAS DEPARTMENT. Tenders by April 30.
LONGFORD GAS COMPANY. Tenders by April 23.
WALLASEY CORPORATION. Tenders by May 9.

Gasholders, Tank, and Alterations.

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by April 27.

General Stores, Paints, &c.

DEVONPORT GAS DEPARTMENT. Tenders by April 30
MORLEY GAS DEPARTMENT. Tenders by April 18.
WALLASEY CORPORATION. Tenders by May 9.

Iron and Steel.

WALLASEY CORPORATION. Tenders by May 9.

Lamp Columns.

WALLASEY CORPORATION. Tenders by May 9.

Lime.

DEVONPORT GAS DEPARTMENT. Tenders by April 30.
MORLEY GAS DEPARTMENT. Tenders by April 8.

Meters (Gas and Water).

DEVONPORT GAS DEPARTMENT. Tenders by April 30.
MORLEY GAS DEPARTMENT. Tenders by April 18.
WALLASEY CORPORATION. Tenders by May 9.

Pipes and Fittings, &c.

DEVONPORT GAS DEPARTMENT. Tenders by April 30.
MORLEY GAS DEPARTMENT. Tenders by April 18.
ST. MARY CHURCH GAS-WORKS. Tenders by April 23.
WALLASEY CORPORATION. Tenders by May 9.

Purifiers, &c.

BALLINASLOE GAS DEPARTMENT. Tenders by April 20.
SOWERBY BRIDGE GAS DEPARTMENT. Tenders by April 27.

Retort Bench, Fittings, &c.

LEEDS GAS DEPARTMENT. Tenders by April 20.
LONGFORD GAS COMPANY. Tenders by April 23.
SOWERBY BRIDGE GAS DEPARTMENT. Tenders by April 27.
SWADLINCOTE GAS DEPARTMENT. Tenders by April 28.

Retorts.

LONGFORD GAS COMPANY. Tenders by April 23.
WALLASEY CORPORATION. Tenders by May 9.

Scrubber, Washer, &c.

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by April 27.

Steel Joists, Roof, &c.

ILFORD GAS COMPANY. Tenders by April 28.
SWADLINCOTE GAS DEPARTMENT. Tenders by April 28.

Tank (Cast-Iron).

ILFORD GAS COMPANY. Tendersby April 28.

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Offices: Commercial Buildings, LEEDS.
Correspondence invited.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty
(First Dutch Bog Ore Company, Ltd.), ROTTERDAM.
General Manager for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

NEW GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE CEMENT PAINT, GAS COAL.
BALE & CHURCH, 5, CROOKED LANE, LONDON, E.C.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

IT is worth your while to buy direct.
THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils. Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

WANTED, Experienced Canvassers for Gas-Cookers. Salary and Commission.
Apply, by letter, in first instance, to JOHN WRIGHT & Co., 19-21, Queen Victoria Street, LONDON, E.C.

WANTED, at once, Gas-Cooker Canvasser. First-Class Firm. Exceptional opportunity. Permanent if good results. Salary and Commission. State experience.
Address No. 4019, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Company in the North of England, an ASSISTANT to the Gas-Works Manager. Salary to commence at £100 per annum.
Applications, with not more than three recent Testimonials, stating Age, Qualifications, and Experience, to be sent by post to No. 4017, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN—SULPHURIC ACID AND SULPHATE OF AMMONIA.

WANTED, a General Foreman for a large Sulphuric Acid and Sulphate of Ammonia Works. Must be a thoroughly competent Man, and have held a similar appointment elsewhere.
Applications, stating Age, Experience, and Wages Required, and accompanied by not more than three Testimonials, to be forwarded, not later than Thursday, April 16, 1903, to No. 4020, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Directors of the Bodmin Gas Comsumers' Company, Limited, invite TENDERS for the supply of 1600 Tons of best GAS COAL, to be delivered free at the Company's Siding, adjoining the London and South-Western Company's Station at Bodmin, in such quantities, and at such times, as may be required within Nine Months of the 15th of May, 1903.
Sealed Tenders are to be sent to me not later than Monday, the 4th of May, 1903.
MARK GUY,
Secretary.

BANGOR URBAN DISTRICT, CO. DOWN.

THE Council of the above District invite OFFERS for the supply of one STEAM-BOILER of about 20-horse power. Also one Horizontal STEAM-ENGINE of 5-horse power.
Persons quoting to state whether new or second-hand; if the latter, how long in use.
Tenders marked "Steam-Boiler" or "Steam Engine," to be delivered at the Town Clerk's Office, Town Hall, Bangor, Co. Down, not later than Twelve o'clock noon, on the 20th inst.
Further Particulars on application to the Gas Manager, Mr. B. Mitchell, Gas-Works.
The successful Contractor or Contractors, as the case may be, will be required to enter into a bond, with approved sureties, for the due performance of the works.
J. MILLIKEN,
Clerk to the Council.
Town Hall, Bangor, Co. Down,
April 9, 1903.

GAS-METERS wanted, old disused Wet. Copper Lamp Frames, Brass, Pewter, Tin, Zinc, Lead Ashes, Old Copper Electric Cable, &c., for Cash.
J. SMITH, Canal Road, BRADFORD.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

TO BE SOLD, Cheap, Twenty New ⌂ RETORTS, 22 in. by 14 in. and 10 ft. 4 in. long outside.
Apply to the MANAGER, Gas-Works, Shipley, YORKSHIRE.

SCRUBBER FOR SALE.

SPLENDID 8 feet by 60 feet Tower SCRUBBER by Walker for immediate SALE. Erected complete. New Distributor, Wood Boards, &c.
J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

FOR SALE—Four 9 feet square Purifiers, complete with 8-inch Centre-Valve, Connections, and Lifting Apparatus. In very good condition. Can work three or four Purifiers as desired. Can be seen at work.
For further Particulars, apply to J. DAVIES, Gas-Works, NANTWICH.

TOWER Scrubber for Sale. In first class condition. 5 ft. by 30 ft., 10-inch Inlet, Outlet, and Bye-Pass Valves, with Connections. Can be seen at Works.
Offers to be sent to ROBERT SIMPSON, Manager, Gas-Works, CAMBUSLANG, N.B.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Very good Gas Plant as under:—
PURIFIERS—Four 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-SCRUBBER, 300,000 cubic feet per diem., with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.
Photos. sent on application to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

RE **GREENALL'S POSITIVE METER SYNDICATE, LIMITED.**
IN LIQUIDATION.

FOR SALE, as a Going Concern—The above-named Business, consisting of the Patent Rights, Plant, and Stock-in-Trade. The Works are situate in Kirkstall Road, Leeds.
For Particulars, apply to the Liquidator, J. W. CLOSE, Chartered Accountant, No. 7, Greek Street, LEEDS.

ILFORD GAS COMPANY.
TO BUILDERS AND CONTRACTORS.

THE Directors of the Ilford Gas Company invite TENDERS for the construction of BUILDINGS, &c., and CHIMNEY for new Boiler Plant at their Works, Ilford, Essex.
Complete sets of Drawings, with Specification, can be obtained on payment of Two Guineas to the Engineer, Engineer's Office, at the Gas-Works, High Road, Ilford.
Sealed Tenders, endorsed "New Boiler Plant," to be sent in not later than the 28th day of April, 1903.
Gas-Works, Ilford,
April 7, 1903.

ILFORD GAS COMPANY.
GAS-WORKS EXTENSIONS.

THE Directors of the above Company invite TENDERS for the under-mentioned Works—viz.:—
(*a*) CAST-IRON TANK.
(*b*) STEEL ROOFS and FLOORS.
(*c*) LANCASHIRE BOILERS.
Copies of Specifications and Drawings of "*a*" and "*b*" can be obtained on payment of One Guinea each to the Engineer, Gas-Works, High Road, Ilford.
Sealed Tenders, endorsed "———," to be sent in not later than the 28th day of April, 1903.
Gas-Works, Ilford,
April 7, 1903.

TENDERS FOR GAS COAL.

THE Brentwood Gas, Coke, and Light Company, Limited, are prepared to receive TENDERS for the supply of 5500 tons of good, clean, fresh-worked GAS COAL, screened and unscreened, for the Year ending April 30, 1904.
Deliveries to be free to Brentwood Station (G.E.R.), in trucks with doors at both ends, in quantities to be subsequently determined.
Not less than 2000 tons of any one description of Coal will be taken.
No Form of Tender issued.
Tenders to be delivered to the undersigned on or before Friday, May 1, 1903.
The lowest or any Tender not necessarily accepted.
C. A. FIELDER,
Secretary.
Brentwood, Essex,
April 9, 1903.

EXHAUSTER, small Whimster's, Wanted.
Address W. KEY, Gas Company, Ceres, FIFESHIRE.

LONGFORD GAS COMPANY, LIMITED.

THE Directors of the above Company invite TENDERS for the supply of about 800 Tons of best GAS COAL, delivered Free into Midland Great Western Trucks at North Wall, Dublin, in cargoes of up to 400 Tons.
The Tenders (endorsed) must reach the undersigned not later than April 22, 1903.
The Directors do not bind themselves to accept the lowest or any Tender.
W. E. YOUNG,
Engineer and Secretary.
Gas Offices, Longford,
April 9, 1903.

LONGFORD GAS COMPANY, LIMITED.
TENDERS FOR RETORTS, BRICKS, AND MACHINERY.

THE Directors of the above Company invite TENDERS for the supply of FIRE-CLAY RETORTS, BRICKS, and FIRE-CLAY; also for RETORT BENCH IRONWORK.
Particulars can be obtained from the undersigned.
They also invite OFFERS for the supply of a GAS-ENGINE of from 1 to 1½ horse power, and EXHAUSTER to pass 2000 cubic feet per hour. Either new or in good second-hand Condition.
All goods must be delivered f.o.r. at Dublin.
Sealed and endorsed Tenders to reach the undersigned not later than April 23, 1903.
The lowest or any Tender not of necessity accepted.
W. E. YOUNG,
Engineer and Secretary.
Gas Offices, Longford.
April 9, 1903.

DEVONPORT CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for their requirement, as under, for the Year ending the 31st of March, 1904—namely,
1. TUBES and FITTINGS.
2. OILS and PAINTS.
3. METERS.
4. LEAD and COMPO. TUBE.
5. FIRE-CLAY GOODS.
6. LIME.
7. CARTAGE.
8. SUNDRIES.

Specifications, and Forms of Tender can be obtained on application to the undersigned.
The Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed as above, to be sent to A. B. Pilling, Esq., Town Clerk, Devonport, on or before the 30th of April, 1903.
SIDNEY E. STEVENSON,
Engineer and Manager.
Gas-Works, Devonport.

CORPORATION OF DEVONPORT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for 35,000 Tons of GAS COAL, to be delivered during the Year ending June 30, 1904.
Copies of Specification and Forms of Tender may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tenders for Coal," to be sent to A. B. Pilling, Town Clerk, Devonport, on or before the 9th of May, 1903.
The Committee do not bind themselves to accept the lowest or any Tender.
SIDNEY E. STEVENSON,
Engineer and Manager.
Gas-Works, Devonport.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.
GAS-WORKS EXTENSIONS.

THE above Council invite Tenders for the following Extensions at their Luddenden Foot Gas-Works, which they propose to carry out subject to the sanction of the Local Government Board being obtained to the same.
TENDER No. 1—For the supply and erection of a TWO-LIFT GASHOLDER with Steel Tank, 54 ft. diameter by 18 ft. 9 in. deep.
TENDER No. 2—(*a*) CUTTING OUT EXISTING SINGLE-LIFT from 70 ft. diameter by 26 ft. deep Gasholder and REPLACING WITH ANOTHER LIFT. (*b*) CUTTING OUT EXISTING SINGLE LIFT and REPLACING BY TWO LIFTS with ADDITIONAL GUIDE-FRAMING.
TENDER No. 3—For the supply and erection of a CAST-IRON SCRUBBER, with Washer and Connections.
TENDER No. 4—For the supply and erection of a CAST-IRON PURIFIER, with Connections and Lifting Apparatus.
TENDER No. 5—For the delivery only of Ten 18 in. by 15 in. ⌂ shape MOUTHPIECES, with Lids, &c., complete, Ascension-Pipes, Arch-Pipes, Dip-Pipes, Flue-Boxes, Bends, Buckstays, &c.
All in accordance with Drawings, which can be seen, and Specifications and Forms of Tender obtained, on application to the Engineer, Mr. A. W. Bissell, Gas-Works, Sowerby Bridge.
The Council do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender No. 1, 2, or 3," &c., to be received by the undersigned not later than Twelve o'clock noon on Monday, the 27th of April, 1903
R. W. EVANS,
Clerk to the Council.
Commercial Bank Chambers,
Halifax, April 2, 1903.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL

ARE prepared to receive Tenders for the supply (only) of FITTINGS, HYDRAULIC MAINS, SELF-SEALING MOUTHPIECES, STEEL JOISTS, VALVES, CONNECTIONS, &c., &c., for 28 Retorts.

Specifications, Form of Tender, and Schedule of Quantities may be obtained on application to the undersigned.

Tenders, endorsed "Retort-Fittings," to be delivered on or before Twelve noon, Tuesday, the 28th of April, 1903.

The lowest Tender not necessarily accepted.

G. B. SMEDLEY,
Engineer and Manager.

BOROUGH OF TORQUAY.

ST. MARY CHURCH GAS UNDERTAKING.

THE Gas Committee of the Torquay Town Council invite TENDERS for the supply and delivery of the following GAS-PIPES:—

1580 yards of 12-inch Pipes.
580 " " 10-inch "

Further Particulars, Specification, and Form of Tender, may be obtained from Mr. Francis Chalmers, Engineer, St. Mary Church Gas-Works, Torquay.

Tenders to the undersigned by Twelve noon on the 23rd of April, 1903.

The Committee do not bind themselves to accept the lowest or any Tender.

FREDK. S. HEX,
Town Clerk.

Torquay, April 1, 1903.

THE BOROUGH OF MORECAMBE.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the above are prepared to receive TENDERS for the supply of 5000 Tons of Unscreened GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in the Corporation's own Waggons, or in Colliery Waggons, in such quantities as may be required by the Engineer.

Tenders, specifying the description of Coal, the name of the Pit at which it is raised, and the Terms for net monthly payments, are to be sent in on or before Monday, the 4th of May, 1903, endorsed "Tenders for Coal."

The Gas Committee do not bind themselves to accept the lowest or any Tender.

JAMES R. DUFF,
Engineer and Manager.

Market Street, Morecambe,
April 7, 1903.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

CONTRACTS FOR COAL AND CANNEL.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply, over a period of Twelve Months from the 30th of June next, of about 7000 Tons of CANNEL and 24,000 Tons of screened GAS COAL, delivered in Railway Waggons at Duke Street, Birkenhead.

A copy of the Specification and any other Information may be obtained on application to the Engineer and Manager, Mr. J. H. Crowther, at his office at the Works, Great Float, near Birkenhead.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the undersigned, to be delivered, per post, at my office as below, not later than Saturday, the 9th day of May, 1903.

The Contractors will be required to enter into a Bond, with approved Sureties, for the due performance of their respective contracts.

The Council reserve the right to accept the whole or any part of a Tender, and do not bind themselves to accept the lowest or any Offer.

By order,
H. W. COOK,
Clerk and Solicitor to the Council.

Public Offices,
Egremont, Cheshire,
April 8, 1903.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

CONTRACTS FOR STORES.

THE Wallasey Urban District Council are prepared to receive TENDERS to supply, over a period of Twelve Months from the 30th of June next, the following among other Articles, being the principal STORES required for use at the Gas and Water Works, viz.:—

WROUGHT IRON TUBE.	FIRE-BRICKS and RETORTS, &c., &c.
LEAD PIPE.	IRON and BRASS COCKS.
WROUGHT IRON and STEEL.	LAMP COLUMNS.
MAIN PIPES, VALVES, AND HYDRANTS.	OILS and PAINT.
	GAS and WATER METERS.

Further Particulars with Form of Tender, may be had, and samples inspected, on application at the Engineer's or Manager's Office, at the Great Float, near Birkenhead.

Sealed Tenders, which must be on printed Form, endorsed "Tender for Gas and Water Stores," and addressed to the undersigned, to be delivered, per post, at my office, as below, not later than Saturday, the 9th of May, 1903.

The Contractors will be required to enter into a formal Contract.

The Council reserve the right to accept the whole or part of a Tender, and do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK.
Clerk and Solicitor to the Council.

Public Offices, Egremont, Cheshire,
April 8, 1903.

BARNOLDSWICK URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE above Council invite Tenders for the supply of 2700 Tons of screened GAS COAL for the year ending June 30, 1904.

Tenders to be sent in on or before Friday, May 1, 1903.

Particulars and Form of Tender may be obtained from the undersigned.

HARRY SCOTT,
Engineer and Manager.

Town Hall,
Barnoldswick, Yorkshire.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 5th of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 31st of December, 1902, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 21st inst. to the 5th prox., both days inclusive.

The Dividend will be paid on the 12th of May.

By order of the Board,
ROBERT W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
April 9, 1903.

BALLINASLOE URBAN COUNCIL.

TENDERS REQUIRED FOR PURIFIERS AND CONDENSERS.

THE Urban Council will, at their Meeting to be held on Monday, the 20th of April, 1903, be prepared to receive and consider TENDERS for supplying and erecting, at the Ballinasloe Gas-Works:—

Two PURIFIERS, 10 feet square, with four trays in each Purifier.

Two 8-inch Four-way VALVES for working same.

Cast-Iron CONDENSERS to deal with 100,000 cubic feet of Gas per Twenty-four Hours.

Condensers to have 8-inch Connections, Bye-Pass Valves, Drip Pipes and Cups, and Fly Valves.

Plans and Specification of the Works invited.

Tenders, addressed to the presiding Chairman, Urban Council, Ballinasloe, and endorsed "Purifiers and Condensers," will be received by me up to Twelve o'clock noon on the above-named day.

The lowest or any Tender not necessarily accepted.

By order,
R. J. GILL,
Clerk to the Council.

Urban Offices, Ballinasloe,
April 6, 1903.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF FOUR PER CENT. PREFERENCE STOCK.

MINIMUM PRICE, £102 10s. PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors to SELL BY TENDER, FIFTY THOUSAND POUNDS of the NEWCASTLE-UPON-TYNE and GATESHEAD GAS PREFERENCE STOCK, 1901, entitled to a fixed Preferential Dividend of Four Pounds per Centum per Annum payable out of the Profits of each Year in priority to any Dividends on the Ordinary Stock, to be issued under the powers of the Company's Act of 1901.

Particulars and Forms of Tender may be obtained on application to the undersigned, and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 21st of April, 1903.

The Stock will be allotted to the highest Tenderers, but no Tender will be accepted at a lower Price than £102 10s. per cent.

THOMAS WADDOM,
Secretary.

Office: 35, Grainger Street West,
Newcastle-upon-Tyne,
April 1, 1903.

YORK UNITED GASLIGHT COMPANY.

SALE BY TENDER OF PREFERENCE STOCK,

Under the Provisions of the York United Gaslight Company's Act, 1898.

MINIMUM PRICE £100 PER CENT.

NOTICE is Hereby Given, that, in pur- suance of a Resolution passed at a Meeting of the Company specially convened for the purpose and held on the 26th day of March, 1903, it is the intention of the Directors to SELL BY TENDER £40,000 PREFERENCE STOCK, entitled to a Maximum Preferential Dividend of £4 per cent. per annum, and to be paid up in full on or before the 30th day of May, 1903; being a portion of the Additional Capital authorized to be raised under the above-named Act.

Particulars and Conditions of Tender may be obtained on application at the Gas Company's Office, Davygate, York, or at the York City and County Bank or any of its Branches; and sealed Tenders, marked "Tender for York Gas Stock," must be lodged with the Gas Company, Davygate, York, or with the York City and County Banking Company, Limited, York, or any of its Branches, not later than Ten o'clock a.m. on Monday, the 27th of April, 1903.

By order,
MATTHEW LEAF,
Secretary.

Gas Offices, Davygate,
York, March 27, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ALDERSHOT GAS AND WATER COMPANY.

NEW ISSUE OF 575 £10 "F" ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

TONBRIDGE GAS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WEST KENT GAS COMPANY.

100 £10 FULLY-PAID ORIGINAL SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

DOVER GAS COMPANY.

ISSUE OF £5000 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 28, a Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ILFORD GAS COMPANY.

NEW ISSUE OF £6000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, April 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

HORLEY DISTRICT GAS COMPANY.

NEW ISSUE OF £5000 FIVE PER CENT. PREFERENCE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 28, at Two o'clock precisely, in Lots.

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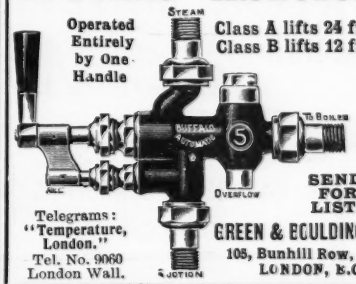

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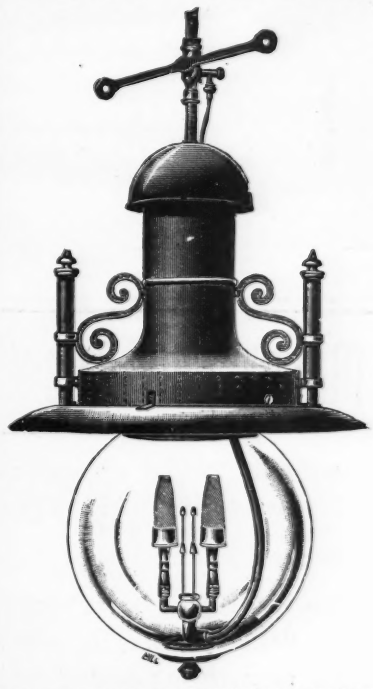

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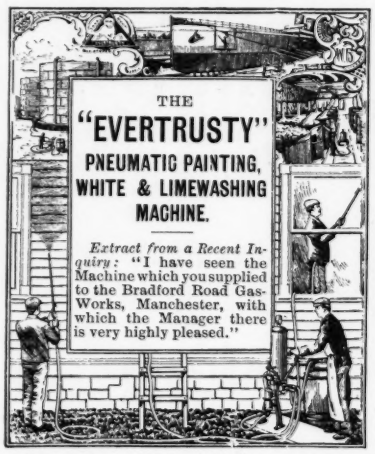

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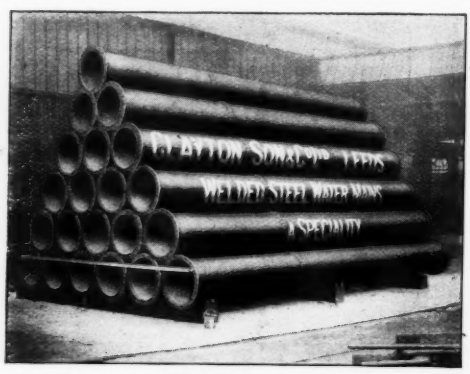

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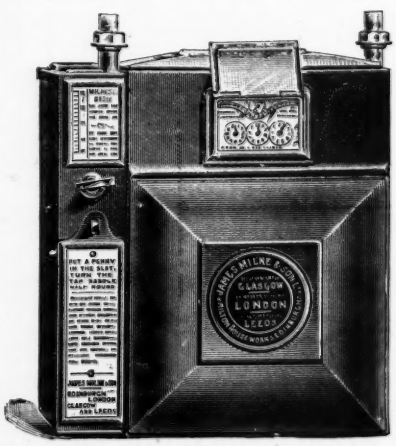

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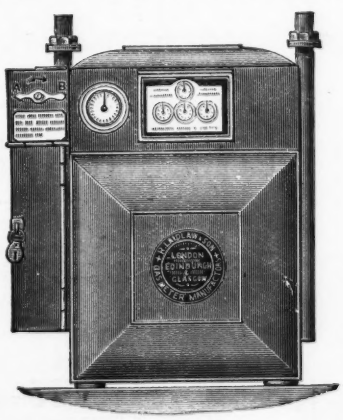

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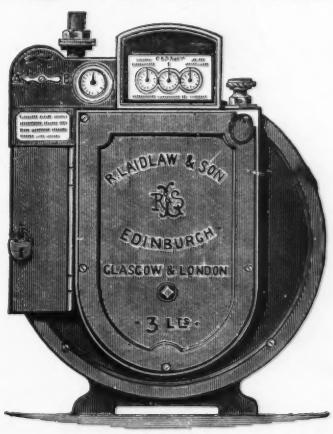

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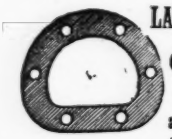

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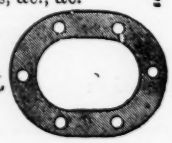

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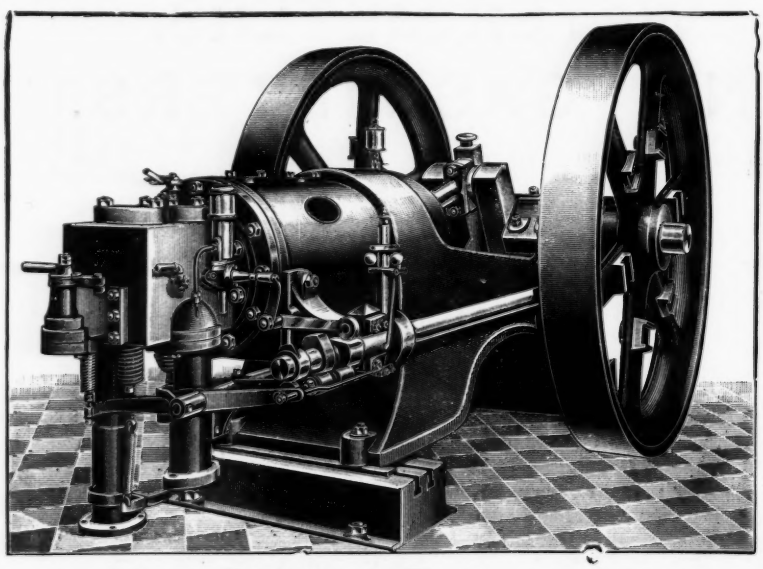

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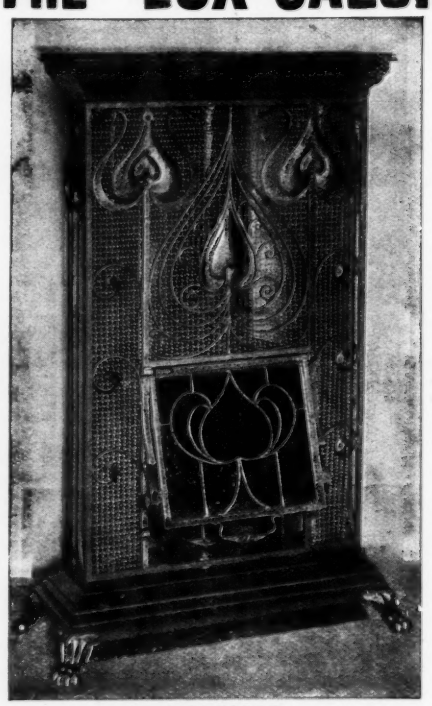

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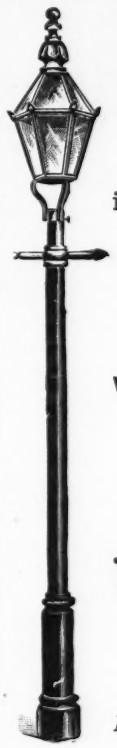

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